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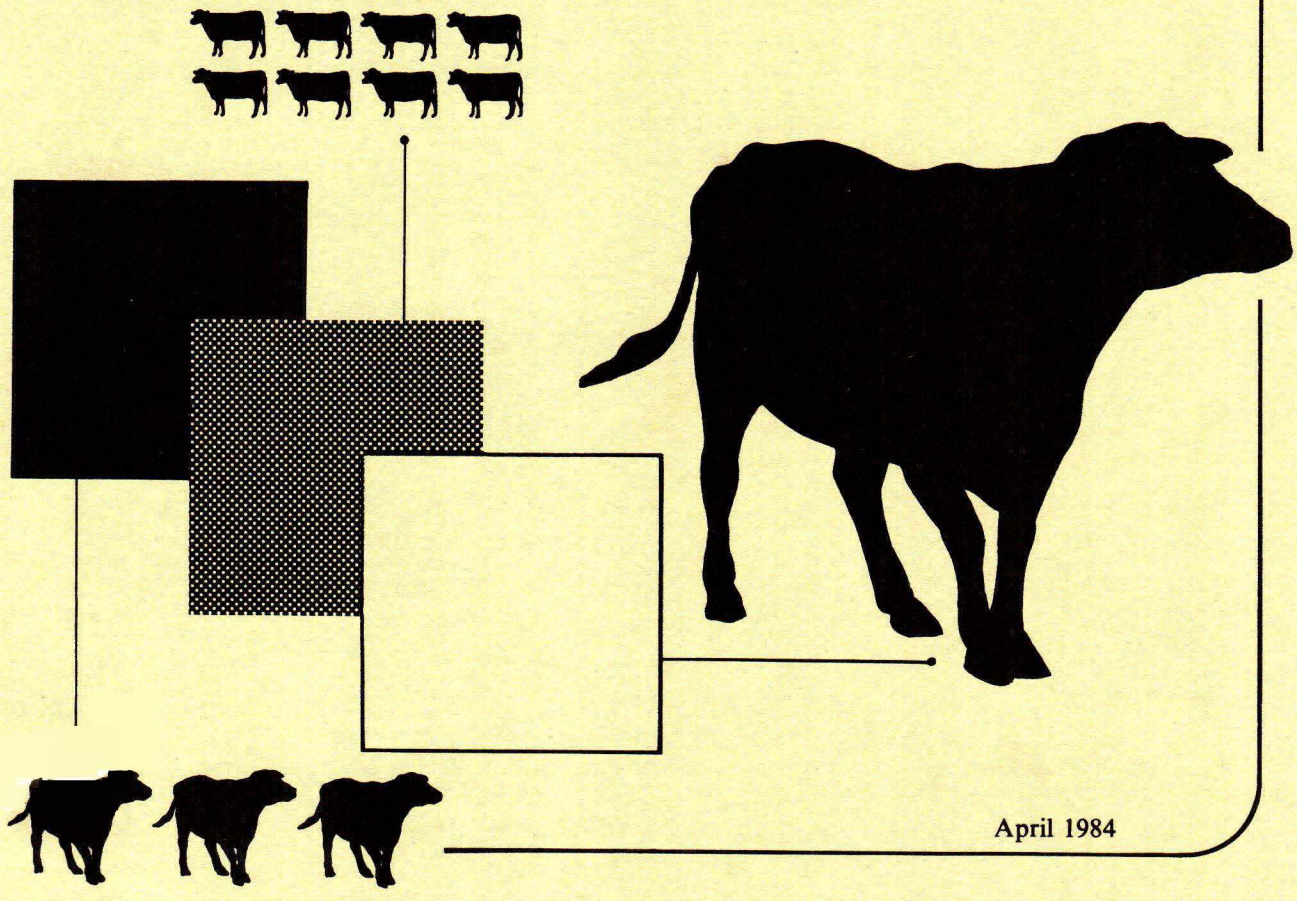
EVALUATION OF ALTERNATIVE MARKET ORGANIZATIONS FOR HAWAII'S BEEF INDUSTRY

A Study of the Impact of Size, Location, and Concentration

Michael N. Muench, Peter V. Garrod, Chauncey T. K. Ching and James C. Nolan, Jr.



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EVALUATION OF ALTERNATIVE MARKET ORGANIZATIONS FOR HAWAII'S BEEF INDUSTRY:

A Study of the Impact of Size, Location, and Concentration

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PREFACE

This is the fourth report in a series on the market structure and performance of the beef cattle industry in Hawaii. The first report describes the market structure for Hawaii-produced beef. It contains a complete description of the existing beef marketing structure in the state. As such it provides an explicit starting point to consider alternative organizations. Perhaps the most striking conclusion from this first report is the relative lack of market coordination in the beef industry. This, in large part, is due to the use of the consignment system in both feeding and slaughtering. Consignment results in a very inadequate transmission of price signals to the producer on the market demand for beef.

The second report in this series describes alternative marketing structures. This report examines the various types of market organizations for beef existing on the mainland and in several parts of the world and recent trends in these organizations. The main focus of this report is on how different market structures achieve market coordination. One possible form is the cooperative. However, cooperatives are just one mechanism through which coordination can be achieved. Whatever the organization selected, the emphasis should be on achieving improved signals from the consumer to the producer.

The third report is a brief summary and overview of the main findings described in the first two reports.

OVERVIEW

The current market organization of the Hawaii beef cattle industry is characterized by the concentration of feeding and slaughtering facilities on the island with the major market for beef, Oahu. Eighty percent of the feedlot capacity is located on Oahu, 56 percent of the cattle produced in the state are slaughtered on Oahu, and three plants -- two on Oahu and one on Hawaii -- account for over 70 percent of the cattle killed. The remainder is accounted for by smaller feedlots and slaughter plants located on other islands. The question being addressed in this report is whether marketing resources can be reorganized in a more efficient or cost effective manner. Specifically, what are the capital and operating costs of various alternatives and how do these costs compare to the present situation? Further, given the specific type of market structure reorganization, which segments of the industry will benefit and which segments will lose?

Given the relatively small size and limited geographical distribution of the Hawaii beef cattle industry, the market reorganization alternatives (scenarios) described and analyzed illustrate the probable range of costs and benefits of reorganization. In this report, seven alternative organizations and the current situation are discussed.

The current costs of marketing beef for each island and for the state are summarized in Table 1. This table also shows the percentage change in costs for marketing all beef, fed beef, and range and cull animals for each island and the State for each of the seven scenarios considered. A comparison of the seven marketing alternatives and the status quo indicates that centralization of feeding, slaughter, and processing operations is an important factor in reducing cattle marketing costs. The economies of size, which are achievable through the concentration of these activities, tend to outweigh the added costs involved in shipping feeders to one point for feeding, slaughter, and processing. The savings which occur as a result of centralization are not, however, evenly distributed throughout the islands. Some marketing alternatives reduce statewide

TABLE 1.
CURRENT COSTS AND PERCENTAGE CHANGES UNDER ALTERNATIVE SCENARIOS

	HAWAII	MAUI	MOLOKAI	OAHU	KAUAI	STATE
Current Costs Per Head						
All Beef	309.03	283.48	372.95	187.24	289.32	298.49
Fed Beef	470.16	437.97	473.35	460.01	490.98	465.59
Range and Cull	96.28	106.46	129.15	96.32	134.17	102.89
Percentage Change in Costs						
1: Kahua Beef Sales Establishes a Feedlot, Slaughtering and Processing Facilities on the Big Island.						
All Beef	3.42	1.54	2.57	4.43	1.02	2.89
Fed Beef	3.08	1.68	2.66	2.73	1.28	2.68
Range and Cull	5.59	.90	1.80	7.11	.28	3.98
2: Hawaii Meats and Milling Moves to the Big Island.						
All Beef	-2.48	12.16	9.49	5.57	1.40	1.32
Fed Beef	-1.18	12.85	10.22	2.14	1.00	2.12
Range and Cull	-10.83	8.91	2.97	11.02	2.53	-2.91
3: Hawaii Beef Fed On Hawaii and Slaughtered on Oahu.						
All Beef	2.07	-3.22	4.16	2.93	1.65	1.25
Fed Beef	2.39	-3.90	4.63	4.77	2.24	1.49
Range and Cull	.00	.00	.00	.00	.00	.00
4: Each Island has Feeding, Slaughtering, and Processing Facilities Sufficient to Meet Island Demand for Local Beef.						
All Beef	3.79	40.15	158.48	21.57	62.27	23.72
Fed Beef	5.05	14.49	149.94	12.81	29.69	17.67
Range and Cull	-4.32	2.72	25.08	35.52	93.68	1.65
5: Kahua Beef Sales Closes Oahu Facilities.						
All Beef	-3.49	-2.17	-3.94	-5.74	-1.58	-3.21
Fed Beef	-3.68	-2.49	-4.13	-4.25	-1.99	-3.40
Range and Cull	-2.25	-.61	-2.32	-8.12	-.44	-2.22
6: All Major Feeding and Processing facilities are Located on the Big Island.						
All Beef	-4.57	1.95	.75	6.32	.81	-2.33
Fed Beef	-2.79	2.12	.50	3.37	.20	-1.39
Range and Cull	-16.01	1.13	2.97	11.02	2.53	-7.27
7: Twenty Percent of Feeders are Shipped Overseas.						
All Beef[1]	-2.57	-6.12	-1.08	-2.77	.58	-1.65
Fed Beef	2.99	2.56	3.12	3.21	3.66	3.22
Range and Cull	1.60	.26	1.97	8.77	.19	1.37

[1]These data are not strictly comparable to the others in this Table as the relative proportion of fed to range and cull animals changes under the assumptions of Scenario 7. Note that the average cost of marketing both classes of animals increases.

costs but benefit one island at the expense of others. If these distributional effects play a part in the market reorganization decision, then the least-cost alternative may not be the most acceptable scenario for the industry.

The seven scenarios considered require initial investments ranging from zero to $10.58 million. The size of the initial investment does not have any direct correlation with cost savings. Of the three least cost scenarios, only one requires substantial investment (Scenario 6). The other two (Scenario 5 and the present state) require only minimal investment.

The concentration of feeding, slaughter, and processing on the island of Oahu appears to be the most cost effective location scheme. Scenario 5 (closing the smaller of Oahu's slaughter/processing plants) reduces average marketing costs by $9.59 per head relative to the existing system. This saving is distributed between islands in proportion to their use of Oahu feeding and slaughter facilities. All islands show some cost savings under the assumptions of this scenario.

The second most cost effective structural alternative is the location of large feeding, slaughtering, and processing facilities on the big island and the shipment of feeders presently destined for Oahu to these facilities -- Scenario 6. Under this scenario, an investment of $8.3 million is required. Average cattle marketing costs drop $6.94 per head relative to the status quo, while grain-fed cattle marketing costs fall by $6.48 per head. These cost savings, however, accrue only to big island ranchers. Other islands incur increases in average marketing costs under this arrangement.

Marketing costs under the current situation rank third among the possible scenarios considered. However, given the requirements of the two lesser cost alternatives (Scenarios 5 and 6), there are probably insufficient incentive to induce the industry to change from its present organization. Scenario 5 assumes the closing of an organization that has been in existence for many years. It is difficult to visualize a firm with such a long history of operation closing at this point in time. The cost savings would have to be relatively certain and substantial to make Scenario 5 a reality. Scenario 6, which assumes the relocation of the main slaughter facilities to the big island, would increase marketing costs for ranchers located on other islands. Since these ranchers have some influence on the market reorganization decision, it is not likely that such a move would be made unless no other alternative existed or the savings were substantial. Since the present structure of the industry is less costly to Maui, Molokai, and Kauai ranchers, it is unlikely that the change posited in Scenario 5 will occur in the near future unless changes in costs make the move even more advantageous.

Scenarios 1 through 4 are not viable alternatives for the industry. Each requires a substantial investment and the results in net increases in costs.

Evaluation of the seven alternatives indicates that the present structure of the industry is probably the best given the existing structure of costs and production patterns. Though less cost effective than Scenarios 5 and 6 on an industry basis, it appears to deal more effectively with issues that are extremely difficult to quantify. Also, the uneven distribution of net benefits of Scenarios 5 and 6, which are net costs for some ranches, and the magnitude of the potential savings (between 2 and 3 percent), make it unlikely that the industry as a whole would support a change from the existing situation. However, the fact that both of the least-cost scenarios involve an intensification of feeding and processing activities implies that the industry is likely to move towards a higher degree of concentration. Also, if costs on Oahu relative to costs on Hawaii increase or if production on the big island increases, a shift of the principal feeding and processing activities from Oahu to Hawaii becomes more probable.

INTRODUCTION

The major objective of this report is to suggest an answer to the following question: "Can the performance of the beef marketing sector of the Hawaii cattle industry be improved through an alternative organization of marketing resources?" An answer to this question is offered in several separate but related segments. First, the current flows of cattle and beef and estimated marketing costs for these flows are described. Marketing costs include charges for feeding, slaughtering, processing, and transportation. The costs are based on the models described in the Appendices A through D. Statewide flows and estimated costs are described below and the corresponding costs and flows for individual islands are presented in Appendix E. These estimates of current movements of cattle and the associated costs are then used as basis of comparison against which the feasibility of alternative forms of market organizations can evaluated. In the remainder of the report, seven possible market organizations are discussed. We refer to these alternatives as scenarios.

Cautionary Remarks

It should be noted that the procedures used in preparing the various tables are estimates generated through use of computer programs. These programs have two minor but possibly confusing deficiencies. First, dollar amounts are calculated to the nearest cent. The authors wish to stress such exact figures reflect the accuracy of computers but do not imply that estimates are so precise. The figures presented in this paper are approximations based on a wide range of data and assumptions and should be regarded as such. Second, in some tables, figures do not add up exactly. Small variations may occur between the sum of individual items and the total presented in the table. This is due both

to rounding errors and moving data from one table to another. Such variations, however, are of a very minor magnitude and do not change the implications of the information presented. Further, inconsistencies may appear because the authors, in order to facilitate presentation, have taken the liberty of rounding figures presented in text.

Throughout this report, we often use proper names of firms in the industry. Given the small number of firms in the marketing segment of the Hawaii beef cattle industry, the larger firms involved with feeding, slaughter, and processing are well known. Therefore, rather than always using the phrase "the large feedlot on Oahu," we sometimes refer to this operation by firm name. We apologize if this practice offends anyone.

PRESENT FLOWS AND COSTS

Models used to estimate the costs of feeding, slaughtering, processing, and transporting cattle and beef are contained in the Appendices to this report. These cost estimates are used in discussing the present flows and costs of beef and cattle in Hawaii.

Beef production in Hawaii for 1981 was estimated at 28.8 million pounds while consumption was estimated at 94.4 million pounds (Table 2). This was a 65.6 million pound production shortfall for the State. Only the islands of Hawaii and Molokai produced beef in excess of consumption. All islands relied on off-island supplies of beef to meet specific market demands and, except for Oahu, simultaneously shipped cattle and beef to Honolulu, the major market.

Hawaii, for instance, produced 202 percent of its consumption needs and slaughtered on-island only 81 percent of estimated big island consumption (Table 3). When shipments of slaughtered beef from Hawaii to Oahu are taken into account, an estimated 7.83 million pounds, Hawaii supplied only about 40 percent of its local consumption. All neighbor islands exhibit a similar pattern of simultaneously importing and exporting beef. The overall result is an extremely complicated movement of a mixture of live cattle, locally processed beef, imported beef, and mainland beef.

State slaughter in 1981 is estimated at 56,000 head. Costs for the movement of these cattle through various channels is estimated at $16.7 million, which is an average of $298 per head (Table 4). Grain-fed cattle made up 54 percent of the total slaughter while range and cull cattle accounted for 46 percent. These two components of slaughtered cattle marketing are discussed below.

Grain-fed Cattle

In 1981, 30,200 head of grain-fed cattle were marketed in the State of Hawaii. Total marketing costs were estimated at $14.1 million, corresponding to an average cost of $466 per head. Grain-fed cattle are marketed through five principal channels. The costs for the various channels ranges from $410 to $474 per head. The five channels and associated numbers and costs are given in Table 4. The first marketing channel represents the costs

TABLE 2
ESTIMATED BEEF PRODUCTION AND CONSUMPTION BY ISLAND, 1981.

	POPULATION (000)	CONSUMPTION[1] (1,000 lbs)	PRODUCTION (1,000 lbs)	BALANCE (1,000 lbs)
Oahu	763	74606	1605	-73001
Hawaii	92	8996	18200	9204
Kauai	39	3813	3164	-649
Maui and Lanai	65	6356	5221	-1135
Molokai	6	587	617	30
TOTAL	965	94359	28807	-65551

[1]Island consumption estimates are based on Hawaii Agricultural Reporting Service's estimate of 94.359 million pounds consumption of fresh and frozen beef in 1980 and are allocated to each island in proportion to the Department of Planning and Economic Development's population estimates for 1980. A conversion factor of 0.549 was used to convert liveweight to dressed weight.

TABLE 3
BEEF PRODUCTION, SLAUGHTER AND CONSUMPTION BY ISLAND, 1981.

Island	Production	On Island Slaughter	Off Island Supply	Island Consumption
		(in thousands of pounds)		
Hawaii	18200	7280	1716	8996
Kauai	3164	1772	2041	3813
Oahu	1605	1605	73001	74606
Maui, Molokai and Lanai	5838	3444	3499	6943

TABLE 4
ESTIMATED CATTLE MARKETING COSTS BY MARKETING CHANNEL FOR THE STATE OF HAWAII, 1981 FLOWS, 1983 COSTS.

	HEAD	PERCENT	COST	COST|HEAD
Total Slaughter	56000	100	16715440	298.49
Total Grain Fed	30200	54	14060837	465.59
Total Range	25800	46	2654603	102.89
Grain Fed				
1. Feed|Slaughter|Break	2641	9	1197191	453.29
2. Feed|Slaughter|Break|Ship	837	3	370685	441.71
3. Feed|Slaughter|Ship|Break	1338	4	583834	436.34
4. Ship|Feed|Slaughter|Break	23550	78	11156192	473.75
5. Feed|Slaughter	1834	6	752739	410.43
Range and Cull				
1. Slaughter|Break	5052	20	564404	111.72
2. Slaughter|Break|Ship	2421	9	315762	130.43
3. Slaughter|Ship|Break	4671	18	572795	122.62
4. Ship|Slaughter|Break	2798	11	345268	123.39
5. Slaughter	7970	31	606017	76.05
6. Slaughter|Ship	1557	6	132474	85.08
7. Ship|Slaughter	1332	5	117883	88.43

of on-island feeding, processing, and sale. Channels two, three, and four show the methods utilized in delivering boxed beef to the Oahu retail market. The fifth stream accounts for a limited number of fed-beef carcasses that are sold on-island in quarter carcass form. Other marketing channels for delivery of fed-beef may exist but they do not form any substantial part of the market.

The costs associated with each channel are derived by summing the costs of each task involved in moving beef through the channel. For example, the cost of moving beef through channel 2 from the Island of Hawaii is obtained by summing: (1) the cost of moving the feeders to the feedlot; (2) feeding costs; (3) the cost of moving the fed cattle to the slaughterhouse; (4) slaughtering costs; (5) breaking costs; (6) cost of transporting boxed beef to the port; (7) ocean freight charges for boxed beef; (8) transportation charges incurred in Honolulu.

The least-cost channel for delivery of boxed beef to the Oahu market, percent of all grain-fed beef move through the fourth stream at an average cost of $474 per head. This

is the most heavily used channel by all islands that ship feeders to Oahu (Table 5). A number of factors influence the utilization of this higher cost channel: First, the quality of the cattle being produced on neighbor island feedlots and on Oahu is not the same. Neighbor island lots feed for Good-Yield Grades 2 and 3 while Oahu feeding aims for at least Good-Yield 3 and preferably a Choice quality carcass. The neighbor island orientation towards Good grade beef seems to be the combined result of higher feeding costs and the desires of specific market segments on neighbor islands. The market for beef on the neighbor islands is primarily composed of independent grocers on all islands. These stores require beef grading Good-Yield Grades 2 and 3 and demand considerable quantities of range and cull beef. In an aggregate sense, these independent grocers have a limited demand for beef.

Second, stream 4 is the oldest marketing channel for fed-beef. Feeding and processing have traditionally taken place on Oahu and the larger ranches have vested interests in the feedlot and slaughter plants. The effect of these interlinking financial interests is difficult to quantify. This vertical integration of ownership results in certain revenues such as slaughterhouse bonuses payable to ranchers, which might not exist otherwise. On the other hand, the closely held nature of the marketing system has made it seemingly inflexible to change and unresponsive to possible cost efficiencies. On each island a major percentage of feeder cattle moves along this stream; and, in each case, the bulk of the shipments can be traced to a few large ranches which are members of the controlling hierarchy.

Range and Cull Cattle

In 1981, range and cull cattle kill was 25,800 head. This was 46 percent of the total State slaughter. Marketing costs were approximately $2.65 million. This was approximately 16 percent of the total estimated marketing costs for slaughter cattle and corresponds to an average cost of $103 per head. Fifty-one percent of range and cull kill (13,022 head) was consumed on-island; sixty percent of these were wholesaled as carcasses and forty percent as broken or

TABLE 5
ESTIMATES OF PERCENTAGE DISTRIBUTION OF BEEF FLOWS THROUGH EXISTING MARKET CHANNELS BY ISLAND

	HAWAII	MAUI	MOLOKAI	OAHU	KAUAI
Grain Fed					
Number	20200	5500	1700	800	2000
Percentage					
1. Feed|Slaughter|Break	3	14	0	100	25
2. Feed|Slaughter|Break|Ship	3	5	0	0	0
3. Feed|Slaughter|Ship|Break	3	14	0	0	0
4. Ship|Feed|Slaughter|Break	88	55	100	0	50
5. Feed|Slaughter	3	14	0	0	25
Range and Cull					
Number	15300	4800	700	2400	2600
Percentage					
1. Slaughter|Break	8	19	0	91	30
2. Slaughter|Break|Ship	8	10	0	0	30
3. Slaughter|Ship|Break	23	23	0	0	0
4. Ship|slaughter|Break	17	1	21	0	0
5. Slaughter	31	38	57	9	30
6. Slaughter|Ship	8	8	0	0	0
7. Ship|Slaughter	6	1	21	0	10

boned beef. Shipments of range and cull animals and beef to Oahu made up the remaining 49 percent of total range and cull kill. Per head costs for marketing range and cull cattle vary from $85 to $130 per head.

Seven marketing streams are identified for range and cull cattle. These channels as well as the associated number of animals and costs are also presented in Table 4. The first stream supplies broken or boned beef to on-island retailers. Streams two, three, and four supply broken beef to the Oahu markets. Stream five provides carcass beef to local on-island retailers while six and seven are channels for distribution of carcass beef on Oahu. The flow of range cattle does not follow the least cost channel. The traditional systems for delivery of range and cull beef to the Oahu market incur costs above other streams. Usage of these streams appears to be the result of the same factors affecting the flow of fed-beef in combination with the fact that demand is concentrated on Oahu.

ALTERNATIVE MARKETING ORGANIZATIONS

The phrase "alternative marketing organizations" can take on several meanings. In the context of this report, the phrase refers to different ways of organizing beef feeding, slaughtering, and processing facilities with explicit consideration given to transportation costs, size of plant (both feeding, and slaughtering, and processing) and rate of plant utilization. In economic jargon, this approach is referred to as the least cost number, size, and location problem.

Clearly, there are a large number of combinations to be considered in addressing this question. In part, the answer is constrained by the number of producing and consuming regions and the number of viable plant sizes appropriate for the Hawaii beef cattle industry. If there is a large number of viable combinations, it would be reasonable to construct a mathematical programming model to seek least-cost combinations. The precedence for such models has been set by Logan and King, Hurt and Trammel, and Martin. In the latter instance, several stages of processing have been considered.

In Hawaii, there are relatively few alternatives to consider. Thus, rather than taking a mathematical modeling approach, we take a "brute force" approach of identifying the basic alternative organizations that could be considered and estimating the least-cost budget associated with each alternative. This straight forward procedure is applicable because of the relatively small number of alternatives. Thus, with careful selection of the main alternatives, interpolations between the alternatives is possible, and information of sufficient accuracy for planning and decision making purposes is made available for a wide range of possibilities.

In the discussion of the possible changes in costs that might occur under differing scenarios three basic assumptions were maintained. First, it was assumed that flows of processed beef to specific markets remained unchanged. Cattle may be processed at different facilities or shipped to another island for processing, but the ultimate consumer demand for beef on each island is assumed constant. On the island of Hawaii for example, the 1981 consumption of boxed local beef was estimated to be 590 head. This flow is considered unchanged in the different scenarios under consideration. The assumed maintenance of product flow to specific markets is essential if costs generated by the various scenarios are to be comparable.

Second, it was assumed that the market channels described in Table 4 are the only the only feasible market channels. That is, not all possible methods of marketing cattle are considered. For example, the shipment of fed cattle is ignored in all cases but Scenario 3 because of the high death losses reported by many ranchers. Also, as the sale of fed-beef carcasses on Oahu occurs in only a very small number of cases, this channel is also ignored.

Third, cost estimates for outer island grain-fed beef were derived under the assumption that cattle were fed for only 120 days. These animals are usually moved into marketing channels which require lighter weight carcasses grading no higher than Good. However, scenarios considering the establishment of feedlots which produce beef destined for the Oahu Choice beef market must assume that feeding times for all Oahu bound cattle increase to a 140 day feeding cycle, which is sufficient time to produce some animals grading Choice.

SCENARIO ONE: Kahua Establishes Feeding, Slaughtering, and Processing Facilities on the Big Island

Assumptions. The Kahua slaughter plant in Ewa beach is located on leased land which will soon be up for renegotiation. It is possible that the plant will not be able to remain at this site. If the plant were to close, a number of events could occur as a result. The following is one possible outcome:

1. The Kahua slaughter plant closes on Oahu.
2. The decision to close the plant sparks the decision to establish a moderate size slaughter plant on the big island. This plant has a capacity of 80 head per day on a single shift basis. Fed beef is processed as primals, subprimals, and portion cuts; range and cull cows are boned. Marketing facilities and networks on Oahu are maintained and the plant's product moves through existing channels.
3. A feedlot is built in conjunction with the slaughter plant. The feedlot has a one time capacity of 5,000 head.
4. Ranchers on Kauai and Maui presently using Kahua's facilities turn to feedlots and slaughter plants on island and Oahu bound beef moves through existing marketing channels.

TABLE 6.
ESTIMATED FLOWS AND COSTS PER HEAD FOR SCENARIO ONE, 1983 COSTS.

	HAWAII	MAUI	OAHU	MOLOKAI	KAUAI	STATE
			FLOWS			
Total Slaughter	35500	10300	2400	3200	4600	56000
Total Grain Fed	20200	5500	1700	800	2000	30200
Total Range	15300	4800	700	2400	2600	25800
Island Slaughter	25300	7180	400	3200	3340	39421
Off-Island Slaughter	10200	3120	2000	0	1260	16579
Island Grain Fed	12000	2500	0	800	1000	16301
Island Range and Cull	13300	4680	400	2400	2340	23120
Grain Fed						
Feed|Slaughter|Break	590	751	0	800	500	2641
Feed|Slaughter|Break|Ship	10824	252	0	0	0	11076
Feed|Slaughter|Ship|Break	0	749	0	0	0	749
Ship|Feed|Slaughter|Break	8200	3000	1700	0	1000	13900
Feed|Slaughter	586	748	0	0	500	1834
Range and Cull						
Range|Slaughter|Break	1185	912	0	2175	780	5052
Range|Slaughter|Break|Ship	6190	456	0	0	780	7426
Range|Slaughter|Ship|Break	0	1116	0	0	0	1116
Range|Ship|Slaughter|Break	2000	60	150	0	0	2210
Range|Slaughter	4740	1824	400	225	780	7969
Range|Slaughter|Ship	1185	372	0	0	0	1557
Range|Ship|Slaughter	0	60	150	0	260	470
			PER UNIT COSTS			
Total Slaughter	319.59	287.85	382.54	195.53	292.26	307.11
Total Grain Fed	484.65	445.32	485.93	472.59	497.27	478.08
Total Range	101.66	107.42	131.47	103.17	134.54	106.99
Grain Fed						
Feed|Slaughter|Break	437.43	401.34	584.32	472.51	530.09	455.34
Feed|Slaughter|Break|Ship	491.29	410.23	592.59	472.51	536.87	489.45
Feed|Slaughter|Ship|Break	487.91	419.81	596.67	468.90	542.40	419.82
Ship|Feed|Slaughter|Break	486.39	486.25	485.83	472.51	486.25	486.28
Feed|Slaughter	385.06	362.68	540.66	434.12	486.39	403.56
Range and Cull						
Range|Slaughter|Break	114.46	118.92	190.92	106.77	151.07	117.61
Range|Slaughter|Break|Ship	124.32	127.81	199.19	108.26	159.34	128.21
Range|Slaughter|Ship|Break	120.94	137.39	203.27	112.18	120.94	137.40
Range|Ship|Slaughter|Break	130.64	130.31	129.54	110.84	130.42	130.55
Range|Slaughter	62.09	80.26	147.26	68.38	107.37	75.13
Range|Slaughter|Ship	79.84	96.30	162.18	71.08	122.29	83.78
Range|Ship|Slaughter	92.25	91.92	91.15	72.45	92.03	91.73

5. Hawaii Milling and Hawaii Meats maintain their market shares on Kauai, Molokai, and Maui, but lose feeder cattle to the Kahua feedlot on the big island. All big island feeders except those of Parker Ranch are sent to the new facilities. Hawaii Meats handles all Oahu slaughter.

Cattle Flows. It is likely that any feedlot built on the big island would be located in the Waimea area. This is the area of highest concentration of cattle, land is available for such a venture, and nearby port facilities permit importation of feed. Such a location would likely attract a large number of users and it is expected that a well run lot could operate at near 100 percent capacity.

Feeder shipments to Oahu are presently 17,850 head per year (See Appendix Table E-4). With approximately 12,000 head flowing into the new feedlot, the flow of feeders to Oahu would be reduced to 8,200 head per year (Table 6). These are cattle owned by ranches with affiliations with the remaining Oahu feeding and slaughtering facilities.

The location of a slaughterhouse in the Waimea area capable of breaking and/or boning of range and cull cattle could alter present cattle flows considerably. If ranchers choose to deliver most of their range and cull cattle to this plant, the flow through the slaughterhouse would be approximately 13,200 range and cull head per year. There would be an additional 2,000 cull and range cattle that would continue to be shipped live to Oahu for processing.

About 25,200 head, composed of 13,200 range and cull cattle and 12,000 fed cattle, would move through the new slaughter plant (Table 6). The 80 head per day slaughter plant would be operating at 120 percent of single-shift capacity. Approximately 6,000 head would be slaughtered and sold in carcass form, the remaining 19,200 would be processed prior to shipment from the slaughter plant.

Flows of cattle on islands other than the big island would be unaffected by the establishment of the feeding and slaughtering facilities outlined in Scenario 1. The other islands are assumed to continue their use of Oahu facilities for their grain-fed beef production at current levels.

Investment Costs. The establishment of a 5,000 head capacity feedlot on the big island would entail an investment of approximately $1.5 million. This includes the purchase of machinery and equipment ($372,000), fixed assets such as pens and buildings ($869,000), and land costs ($219,000). Per head investment costs would be approximately $292 per head of one time capacity.

Investment costs for an 80 head per day slaughter plant would be approximately $3.24 million, or about $162 per head of annual capacity. An additional investment of $480,000 would be required for the new processing plant. This amounts to approximately $24 per head of annual capacity. Processing would include breaking into primals, or boning and the associated hamburger operation.

Total investment requirements for Scenario 1 would be at least $5.22 million. It is likely that this cost would have to be increased by an additional 10 percent to account for the costs of closing the present Oahu facility, relocating administrative staff and offices, and associated start-up costs not otherwise accounted for in the individual unit investment analysis. Thus, total investment costs would rise to $5.7 million for Scenario 1.

Operating Costs. If the feedlot were built, costs were consistent with the above investment estimates, and the flow into the feedlot were 12,000 head per year, then non-feed operating costs would average approximately $57 per head. Feeding costs on the big island are assumed to average $2.20 per day and feeding would occur over a 140 day period. Total feedlot costs would be almost $4.38 million per year - an average of about $365 per head.

An 80 head per day slaughter plant killing 25,200 head per year, operating at 120 percent of one-shift capacity, would incur estimated operating costs of $1.39 million or an average cost of about $55.00 per head. Processing costs for the approximately 19,000 head per year that are broken or boned are estimated at $54 per head or about $1.0 million per annum.

Though the flows of cattle from other islands to Oahu would not be affected by the changes outlined in Scenario 1, Oahu feeding and slaughtering facilities would have lower utilization rates because of reduced flows from the big island. The effect this would have on operating costs of Oahu operations is difficult to estimate. We assume that feeding, slaughtering, and breaking costs would increase by approximately 10 percent as a result of decreased utilization. This percentage increase in costs reflects the higher unit costs associated with operating a fixed size of plant at lower levels of throughput.

Operating Cost Variations. The cost increases for Scenario 1 relative to the current situation are primarily due to increased feeding and processing costs of newly constructed facilities on the big island. They also result from higher costs on Oahu because of decreased flows through the feedlot and slaughter plant.

Nonfeed operating costs on the big island would decline from $76.50 per head to $56.69 per head, a savings of $19.81 per head of fed beef. However the increase in feeding days required by feeding to meet the demand of the Oahu market for Choice beef would cause costs to rise an additional $44.00 per head. Therefore overall big island feedot costs would increase from $340.50 to $364.69 - an increase of $24.19 per head.

Slaughter costs on the big island would decrease for Scenario 1, falling from $57 to $55.29 -- a decrease of $1.71

per head. This savings results from the full utilization of the new 80 head per day plant which operates at 120 percent capacity. If this plant were not used as the sole big island slaughter plant and flows dropped to 90 percent of capacity – 18,000 head per year -- costs would rise to $58.44 per head and slaughter costs would increase under Scenario 1.

On Oahu, slaughter costs would increase from $57.97 to $61.60 -- a rise of $3.63 per head. Processing costs would increase from $36.05 to $39.60 or $3.55 per head. These costs would affect every island's average marketing costs because each island ships a portion of its feeders to Oahu for fattening and slaughter. On Maui, Molokai, Oahu, and Kauai this would be the only change that occurs under the assumptions of Scenario 1.

Marketing Costs. Estimated costs for flows of cattle and beef through the various marketing channels have been calculated for Scenario 1 (Table 6). Compared to the current situation, average cattle marketing costs for the state increased by $8.62 per head. This is a total increase in state beef marketing costs of $483,000. Note that marketing costs include charges for feeding, slaughtering, processing, and transporting cattle and/or beef.

Statewide marketing costs for grain-fed cattle increased by $12.49 per head from $465.59 to $478.08, a rise of $377,000 in total grain-fed beef marketing costs. The state average range and cull cattle costs rose from $102.89 to $106.99. This is an increase of $106,000 in average range and cull beef marketing costs ($4.10 per head).

Marketing costs on the big island increase also. The average costs of marketing big island grain-fed beef rises dramatically from an average of $470.16 per head to $484.65 per head. This is an increase in grain-fed marketing costs of $293,000 or $14.49 per head. Average marketing costs for big island range and cull animals rise by $4.38 per head from $96.28 to $101.66, an increase of $67,000. Overall, big island average per head costs of marketing rise from $309.03 to $319.59, an increase of $10.56 per head and an increase in total big island marketing costs of $375,000.

The majority of the cattle currently shipped as feeders to Oahu are, under the assumptions of Scenario 1, fed and processed on the big island prior to shipment to the Oahu market. The cost to feed, slaughter, and process on the big island and then ship and sell beef on Oahu is estimated to be $491.27 per head. Shipping a feeder to Oahu for feeding, slaughtering, processing, and final sale now costs $473.81. The same animal, then, can presently be delivered to the Oahu market for $17.46 less than would be possible under the assumptions of Scenario 1.

Average marketing costs on all other islands increase relative to the existing situation under the assumptions of Scenario 1. The increase ranges from slightly more than 1 percent on Kauai to nearly 4.5 percent on Oahu.

Analysis. It is apparent that the establishment of facilities outlined in Scenario 1 would not result in any cost advantages. When compared with the present cattle marketing methods, state-wide average marketing costs for all cattle increase nearly three percent. The established facilities on Oahu enjoy costs associated with more efficient operation than those considered in Scenario 1. This is particularly true for breaking and boning operations where new facilities require processing rates in excess of available supplies before per head costs approach existing facility costs.

SCENARIO TWO: Hawaii Meat and Hawaii Milling Move to Big Island

Assumptions. The Oahu feedlot is located on leased land in the Campbell Industrial Park. The location of this facility at the Park is not popular with some of the parties involved and at some time in the future feedlot owners could be asked to vacate. If this did occur a number of possible events could occur as a result. The following possible situation will be considered:

1. The Campbell site is vacated and the feedlot is relocated on the big island. The feedlot is located below Waimea, inland from the Kawaehae harbor. The feedlot has a one time capacity of 10,000 head.

2. Moving the feedlot to the big island curtails operation of the main slaughtering plant on Oahu. A slaughter plant is established on the big island. The plant has a one shift capacity of 120 head per day or 30,000 head per year.

3. Processing facilities are established in conjunction with the slaughter plant.

4. Ranchers located on Maui, Molokai, and Kauai presently using the main Oahu facilities turn to local sources for feeding and slaughter. This permits a 5,000 head feedlot to be established on Maui to serve both Maui and Molokai. Slaughtering is carried out at existing facilities. Kauai's needs are met by the establishment of a 1,000 head feedlot and present slaughtering facilities are used. Maui and Kauai ship excess supplies in the form of quarter carcasses to Oahu for processing.

5. The remaining slaughter facilities on Oahu expands processing capabilities to handle quarter carcasses from Maui and Kauai destined for the Oahu market.

Cattle Flows. As explained in Scenario 1, it is likely that any feedlot established on the big island would be located in the Waimea area. The slaughter plant would also be located close to the feedlot. The closing of the Oahu plant offers Hawaii ranchers no option but to use the new feedlot and the entire grain-fed beef flow of over 20,000 head would move through this lot.

TABLE 7.
ESTIMATED FLOWS AND COSTS PER HEAD FOR SCENARIO TWO, 1983 COSTS.

	HAWAII	MAUI	MOLOKAI	OAHU	KAUAI	STATE
			FLOWS			
Total Slaughter	35500	10300	2400	3200	4600	56000
Total Grain Fed	20200	5500	1700	800	2000	30200
Total Range	15300	4800	700	2400	2600	25800
Island Slaughter	35500	10300	400	3200	3600	53000
Off-Island Slaughter	0	0	2000	0	1000	3000
Island Grain Fed	20200	5500	0	800	1000	27500
Island Range and Cull	15300	4800	400	2400	2600	25500
Grain Fed						
Feed|Slaughter|Break	590	751	0	800	500	2641
Feed|Slaughter|Break|Ship	19024	252	0	0	0	19276
Feed|Slaughter|Ship|Break	0	3749	0	0	0	3749
Ship|Feed|Slaughter|Break	0	0	1700	0	1000	2700
Feed|Slaughter	586	748	0	0	500	1834
Range and Cull						
Range|Slaughter|Break	1185	912	0	2175	780	5052
Range|Slaughter|Break|Ship	7327	456	0	0	780	8563
Range|Slaughter|Ship|Break	0	1176	0	0	0	1176
Range|Ship|Slaughter|Break	0	0	150	0	0	150
Range|Slaughter	4740	1824	400	225	780	7969
Range|Slaughter|Ship	2048	432	0	0	260	2740
Range|Ship|Slaughter	0	0	150	0	0	150
			PER UNIT COSTS			
Total Slaughter	301.38	317.95	408.35	197.67	293.36	302.42
Total Grain Fed	464.62	494.24	521.74	469.87	495.89	475.44
Total Range	85.85	115.95	132.98	106.93	137.56	99.90
Grain Fed						
Feed|Slaughter|Break	415.09	479.44	584.32	469.79	530.09	471.73
Feed|Slaughter|Break|Ship	468.95	530.33	592.59	469.79	586.87	469.75
Feed|Slaughter|Ship|Break	476.99	511.24	597.07	456.44	592.80	511.24
Ship|Feed|Slaughter|Break	483.67	483.53	521.73	469.79	483.53	507.58
Feed|Slaughter	373.74	411.71	540.66	431.00	486.39	419.94
Range and Cull						
Range|Slaughter|Break	97.10	147.99	190.92	110.57	151.07	120.42
Range|Slaughter|Break|Ship	106.96	156.88	199.19	112.06	159.34	114.39
Range|Slaughter|Ship|Break	115.00	137.79	203.67	115.98	11.50	137.78
Range|Ship|Slaughter|Break	134.44	134.11	133.34	114.64	134.22	133.32
Range|Slaughter	55.75	80.26	147.26	71.78	107.37	71.46
Range|Slaughter|Ship	73.50	96.30	162.18	74.48	122.29	81.73
Range|Ship|Slaughter	95.65	95.32	94.55	75.85	95.43	94.55

Flows of cattle through the Hawaii slaughter plant are assumed to include all cattle slaughtered on the island, approximately 35,500 head per year (Table 7). This flow would include the 20,200 grain-fed cattle and 15,300 range and cull cattle.

The 5,000 head lot established on Maui which would meet the demands of both Maui and Molokai ranchers. The annual flow through this lot would be approximately 7,200 head if all feeder cattle presently produced on Maui and Molokai were fed there.

Slaughter on Maui would include 7,200 fed cattle and approximately 5,100 range and cull cattle. Approximately 9,500 of the 12,300 head slaughtered on Maui would be broken prior to sale while the remaining 2,800 head would be sold as carcass beef. The majority of carcass sales, 2,050 head, are range and cull animals and only 750 fed beef are sold in unbroken form.

Investment Costs. The establishment of a 10,000 head feedlot on the big big island would require an initial investment of $2.57 million. This would include the purchase of machinery and equipment ($0.684 million), fixed assets such as pens and buildings ($1.47 million), and land costs ($0.419 million). For a 10,000 head feedlot, this amounts to an average investment of approximately $257 per head.

Investment costs for a 120 head per day slaughter plant would be approximately $4.47 million. This is about $148 per head based on a yearly capacity of 30,000 head. The construction of a breaking plant would require additional investments of $0.510 million, or $17 per head of annual capacity.

For Scenario 2, total investment costs for new facilities on the big island would be approximately $8.3 million. This includes a 10 percent increase in costs to account for relocation of staff and office facilities and other expenses involved in moving from Oahu to Hawaii.

The cost of establishing a 5,000 head feedlot on Maui would be similar to costs of feedlot establishment in Scenario 1. The total investment costs would be approximately $1.46 million, which is $292 per head of one time capacity.

In addition to a feedlot, it is assumed that the existing Maui slaughter plant would add breaking and boning facilities. This would require an investment of $0.450 million. This would be approximately $45 per head on an estimated annual capacity of 10,000 head.

The needs of Kauai and Oahu fed-beef producers could be met by the construction of a small feedlot on Oahu. A small lot would require an initial investment of $0.369 million and have an investment cost per head of capacity of $369. It is assumed that the slaughtering and breaking facilities presently in existence on Oahu are sufficient to process Oahu bound cattle.

Total investment requirements for Scenario 2 are $10.58 million. This includes an investment of $8.3 million on the big island, $1.91 million on Maui, and $0.369 million on Oahu.

Operating Costs. Annual operating costs for the big island feedlot established under the assumptions of Scenario 2 average $51.71 per head. This corresponds to an annual cost of $1.04 million for feeding 20,200 head per year.

Slaughter costs at the 120 head per day plant on the big island would be $1.69 million at an annual utilization rate of 35,000 head. This is an average cost of $48.42 per head. Estimated processing costs would be $1.14 million per year or an average of $38.20 per head broken or boned.

Feedlot costs on Maui would average $76.93 per head for an annual cost of $0.554 million for 7,200 head. Maui slaughtering facilities are already in existence and costs are estimated to be $73 per head. This amounts to an annual operating cost of approximately $0.876 million for a slaughter of 12,000 head. On Maui, 10,000 head would be broken or boned annually. Costs for these operations would be about $0.690 million per annum which is an average $69.07 per head.

On Oahu 1,800 head would be fed annually at an average cost of $90.88 per head. Feedlot operating costs would be nearly $0.164 million per year. Slaughtering costs for 4,200 head per year would be $0.273 million or an average of $65 per head. Breaking costs are estimated at $40 per head. Total breaking costs would be $0.168 million. Operating costs on Kauai and Molokai would remain at their current levels.

Operating Cost Variations. Relative to the current situation (See Table 1 and Appendix E), big island slaughtering and transportation costs decrease. Slaughtering costs drop from $57 to $48.95 per head, a decline of $8.05 per head. Transport costs decline because all beef from the big island is shipped as boxed beef and not as live cattle, as is the case for most current shipments.

These cost reductions are partly offset by increases in feeding, breaking, and boning costs relative to the costs currently incurred on Hawaii. Feeding costs rise relative to current feeding costs on hawaii because cattle are fed an extra twenty days to meet Oahu Choice beef market demands. Operating costs for feeding cattle would actually drop in Scenario 2 from $76.50 to 51.71 per head. However the extra days on feed cost an additional $44 per head. The net result would be an increase in feeding costs of $19.20 per head.

Breaking and boning costs would also be higher in Scenario 2 relative to the present situation. The increase in volume requires construction of new facilities and this expense is largely responsible for the higher operating

costs per head. Present processing costs have been estimated at $40 per head while processing costs for Scenario 2 would increase to $42.61 per head.

All costs on Maui, with the exception of slaughtering and transport, increase under the assumptions of Scenario 2. Operating costs for the new 5,000 head feedlot are $49.03 higher than estimates of present costs on Maui lots. This cost difference is partly the result of the annual depreciation and interest costs associated with construction of the new lot. In addition, feeding cattle for the Choice beef market on Oahu requires an additional 20 days feeding at cost of $42 per head. Processing costs increase from $40 to $69.07 with the construction of new facilities capable of handling the loads posited under Scenario 2. Some of these cost increases are offset by savings resulting from changes in the form of beef shipments. Boxed beef predominates in Scenario 2 while a high percentage of present shipments are feeders and carcasses.

Marketing Costs. In comparing present marketing costs with those incurred under the assumptions of Scenario 2, Table 7, overall statewide slaughter costs rise from $298.49 per head to $302.42 per head. This is a rise of $3.93 per head or an increase in costs of $220,000 for the state.

In terms of grain-fed beef, costs rise from $465.59 to $475.44, an increase of $9.85 per head or a state wide increase in grain-fed cattle costs of $297,000. Range and cull cattle marketing costs are, on the other hand, reduced as a result of the assumptions of Scenario 2. Average marketing costs fall from $102.89 per head to $99.90 per head. This is a decrease of $2.99 per head or $77,000 for state average range and cull marketing costs.

On the island of Hawaii, average marketing costs decrease nearly 2. 5 percent, from $309.03 to $301.38 per head. This is a fall in annual marketing costs of $268,000. Big island grain-fed marketing costs fall from $470.16 per head to $464.62 per head -- a cost reduction of over $112,000 and a per head savings of $5.54 for grain-fed beef. Range and cull cattle marketing costs fall from $96.28 to $85.85 per head, a savings of $10.43 per head and a total reduction in costs of $160,000.

Under the present situation most big island feeder cattle are sent through the Oahu feedlot and slaughter facilities. These cattle incur an average cost of $473.81 per head prior to final marketing. Based on the assumptions of Scenario 2, these cattle would reach the retail market at a cost of $468.95. This is a cost savings of $4.86 per head.

Average marketing costs on Maui rise over 12 percent under Scenario 2. Estimated average marketing costs for Maui are presently $283.48 per head. This would increase to $317.95 - an increase of $34.47 per head or an increase in total marketing costs for Maui of $355,000. This increase results from increased costs in marketing both fed animals (12.9 percent) and range and cull animals (8.9 percent).

Average costs on Molokai, Oahu, and Kauai rise in response to the closing of the Oahu feeding and slaughtering facilities and the changes required on each island in response to these assumed closings. The increase ranges from 1 percent for fed beef from Kauai to 11 percent for range and cull animals from Oahu.

Analysis. Scenario 2 appears to be an attractive alternative for the big island, which stands to gain if it were implemented. Big island costs fall nearly 2.5 percent. However, costs on Maui rise by 12 percent, and overall state costs rise one percent under the assumptions of Scenario 2.

SCENARIO THREE: Hawaii Milling Moves to the Big Island and Improved Live Cattle Shipping Methods are Developed.

The general premise of Scenario 3 is similar to that of Scenario 2, i.e., the main feedlot on Oahu closes and relocates on the big island near Waimea. However, unlike Scenario 2, the associated slaughter plant on Oahu is not closed. With the assumed development of a successful method of transporting fed beef, cattle fed on the big island and Maui are shipped by barge to slaughter plants on Oahu. It is further assumed that cattle originating on Molokai, Oahu and Kauai, which have in the past been shipped as feeders to Oahu continue to be fed on Oahu. However, since cattle flows are greatly reduced, a smaller lot is built for this function.

Assumptions

1. The Oahu feedlot relocates on the big island. It establishes its feedlot below Waimea inland from the Kawaehae harbor. The feedlot has a one time capacity of 10,000 head.

2. A method for successful shipment of live fed cattle is developed and proves reliable. The largest Oahu slaughter plant remains the main state facility. A smaller feedlot (1,500 head capacity), is established to handle non-big island feeder cattle.

3. The largest Oahu slaughter plant expands processing facilities. Processing can be carried out at a rate of 120 head per day on a single shift basis.

4. Ranchers located on Maui, Molokai, and Kauai presently using Oahu facilities continue to ship according to present trends.

Cattle Flows. The number of big island cattle fed is in excess of 20,000 head per year. An efficiently managed 10,000 head lot could handle 24,000 head each year. The closing of the Oahu feedlot would likely cause all big island ranchers to use the new facility. This lot would then function at 83 percent capacity. On completion of feeding, 17,850 head would be shipped to Oahu for slaughter. An additional 3,450 range and cull animals would also be shipped to Oahu for slaughter (Table 8).

TABLE 8.
ESTIMATED FLOWS AND COSTS PER HEAD FOR SCENARIO THREE, 1983 COSTS.

	HAWAII	MAUI	MOLOKAI	OAHU	KAUAI	STATE
			FLOWS			
Total Slaughter	35500	10300	2400	3200	4600	56000
Total Grain Fed	20200	5500	1700	800	2000	30200
Total Range	15300	4800	700	2400	2600	25800
Island Slaughter	14202	7180	400	2300	3340	28322
Off-Island Slaughter	21298	3120	2000	0	1260	27678
Island Grain Fed	20201	5500	0	800	1000	27501
Island Range and Cull	11850	4680	400	2400	2340	21670
Grain Fed						
Feed|Slaughter|Break	590	751	0	800	500	2641
Feed|Slaughter|Break|Ship	587	252	0	0	0	839
Feed|Slaughter|Ship|Break	589	749	0	0	0	1338
Ship|Feed|Slaughter|Break	0	0	1700	0	1000	2700
Feed|Slaughter	586	748	0	0	500	1834
Feed|Ship|Slaughter|Break	17849	3000	0	0	0	20849
Range and Cull						
Range|Slaughter|Break	1185	912	0	2175	780	5052
Range|Slaughter|Break|Ship	1185	456	0	0	780	2421
Range|Slaughter|Ship|Break	3555	1116	0	0	0	4671
Range|Ship|Slaughter|Break	2588	60	150	0	0	2798
Range|Slaughter	4740	1824	400	225	780	7969
Range|Slaughter|Ship	1185	372	0	0	0	1557
Range|Ship|Slaughter	863	60	150	0	260	1333
			COST PER UNIT			
Total Slaughter	314.69	274.35	388.48	192.73	294.08	301.77
Total Grain Fed	480.12	420.87	495.27	481.95	501.96	471.68
Total Range	96.28	106.46	129.12	96.32	134.18	102.89
Grain Fed						
Feed|Slaughter|Break	450.53	401.34	584.32	481.95	530.09	454.42
Feed|Slaughter|Break|Ship	474.39	452.23	592.59	481.95	536.87	467.73
Feed|Slaughter|Ship|Break	481.09	458.26	593.12	483.68	538.85	468.31
Ship|Feed|Slaughter|Break	495.83	495.69	495.27	481.95	495.69	495.42
Feed|Slaughter	381.79	362.68	540.66	447.11	486.39	402.51
Feed|Ship|Slaughter|Break	485.45	428.30	497.28	481.95	502.26	477.22
Range and Cull						
Range|Slaughter|Break	102.54	118.92	190.92	99.59	151.07	111.72
Range|Slaughter|Break|Ship	112.40	127.81	199.19	101.08	159.34	130.43
Range|Slaughter|Ship|Break	119.10	133.84	199.72	105.00	119.10	122.62
Range|Ship|Slaughter|Break	123.46	123.13	122.36	103.66	123.24	123.39
Range|Slaughter	63.80	80.26	147.26	64.75	107.37	76.05
Range|Slaughter|Ship	81.55	96.30	162.18	67.45	122.29	85.08
Range|Ship|Slaughter	88.62	88.29	87.52	68.82	88.40	88.43

The 3,000 head from Maui which are presently sent to the Oahu feedlot would remain on Maui for feeding and then be sent as fat cattle to Oahu. Maui feeding would increase from 2,500 to 5,500 head per year. Range and cull cattle flows to Oahu would remain unchanged at 120 head per year. Under the assumptions of Scenario 3, cattle flows on Molokai, Oahu and Kauai also remain unchanged.

Investment Costs. The investment costs involved in the establishment of a 10,000 head feedlot on the big island have been presented in detail in the discussion of Scenario 2. Total investment requirements for this lot would be $2.57 million or an averages of $257 per head.

The increased cattle feeding on Maui could be carried out on the two lots presently operating on the island. It is unlikely that additional investment would be required to support the additional number of animals being fed on-island.

If a new 1,500 head lot were established on Oahu to meet the needs of ranchers on Molokai, Oahu, and Kauai, investment requirements would be $554,000 or an average of $369 per head. Total investment requirements for Scenario 3, for the new feedlots on the big island and Oahu, are estimated at $3.12 million.

Operating costs. Annual nonfeed operating costs for the big island feedlot established under the assumptions of Scenario 3 would average $51.71 per head. With feeding costs averaging $2.20 per head per day, the total cost of feed lot operation is estimated at $359.71 per head. Annual feeding and operating costs for 20,200 head amounts to $7.27 million.

Nonfeed operating costs for the 1,500 head lot on Oahu average $76.02 per head and total operating costs, including feeding, average $380.02 per head. This results in annual operating costs of $1.33 million.

Operating costs for Maui feedlots are expected to change only to the extent that an increased feeding period is required to meet the needs of the Oahu market. Average feedlot cost is $321.90 per head. Total annual operating costs for Maui feedlots are approximately $1.77 million at an annual throughput of 5,500 head. Operating costs on Molokai and Kauai do not change under the assumptions of Scenario 3.

Operating Cost Variations. Feedlot operating costs on the big island decrease from $76.50 to $51.71 per head. However, the increased feeding periods required for the Oahu Choice beef market cause feed costs to increase by $44 per head relative to current feeding costs on Hawaii. The net result is an increase in feedlot costs of $19.20 per head.

Increased feeding times on Maui for Oahu bound cattle cause feedlot costs to rise $42 per head from $279.90 to $321.90 while costs for locally slaughtered and consumed remain constant. No additional cost increases occur on Maui. Oahu feedlot operating costs increase as a result of the closing of the large feedlot and the opening of a smaller lot. Costs increase from $54 to $76.02 per head. All other costs involved in marketing cattle remain unchanged in Scenario 3.

Marketing Costs. Marketing costs for the state increase 1.25 percent, or an annual increase in overall state marketing costs of $209,000. The entire increase is due to the increased cost of marketing grain-fed animals -from an estimated $465.59 under the existing system to $472.53 per head for Scenario 3.

Average marketing costs for big island cattle increase 2 percent or an increase in big island marketing costs of $208,000 per year. The increase is due the increased costs of feeding, slaughtering, and processing beef on the big island.

On Maui, average marketing costs for slaughtered cattle decline from $283.49 to 274.35 - a savings of $9.14 per head. The cost reduction results from two factors: (1) the more efficient use of existing feedlots on Maui; and (2) as fed cattle rather than feeders are shipped to Oahu, a twenty day recovery period on feed is not longer required. Total marketing costs are reduced by $94,000 and the entire cost decrease accrues to grain-fed cattle. This amounts to a decrease in total marketing costs from $437.97 to $420.87 per head, or $17.10 per head.

Marketing costs on other islands increase for grain-fed beef due to increases in Oahu feeding costs.

Analysis. Scenario 3 provides few advantages over the present marketing system for cattle. The primary advantage of the scenario is a decline in grain-fed beef marketing costs on Maui. This is caused by increased usage of existing Maui feedlots which results from the closing of the main feedlot on Oahu. The scenario fails, however, to reduce the cost of marketing big island grain-fed beef on Oahu. And it is this goal that is perhaps the key to any potentially successful alternative marketing system. It does not appear that the shipment of fed cattle is an economically viable alternative even if shipping methods were perfected.

SCENARIO FOUR: Each Island has Feeding and Processing Facilities

Assumptions. In the past few years there has been a growing trend in Hawaii for each island to utilize its production to satisfy island demand. This has been particularly evident on Maui and Kauai and more recently on the big island. Continuation of this trend could result in the closing, or a severe reduction in use, of Oahu facilities for feeding and slaughtering cattle. The outcome would be

that each island would be required to meet its own feeding and slaughtering needs. Such a possibility could create the following situation:

1. Expanded feedlot facilities on Maui coupled with increased processing by existing local plants reduce the flow of beef to Oahu from Maui almost completely.
2. Processing and feeding on Hawaii expand to satisfy island demand with remaining supplies shipped to Oahu.
3. Kauai feeding and slaughtering expand to the point where local production goes completely toward satisfying island demand.
4. Molokai production continues to flow to Oahu after local needs are met.

Cattle Flows. Scenario 4 assumes that the statewide flow of cattle is determined by the on-island consumption. Individual islands act first to satisfy their own needs and ship to Oahu after these have been fully met. Only the islands of Hawaii and Molokai will ship cattle to Oahu since only these islands have cattle in excess of island needs. Slaughter of Oahu cattle would remain unchanged under the assumptions of Scenario 4.

It has been estimated that big island beef production is approximately 200 percent of island consumption of fresh and frozen beef. The assumption that every animal slaughtered contributes approximately the same quantity of beef permits estimates of on-island production, consumption, and shipments to Oahu. Total big island consumption of beef is 8.9 million pounds (Table 2) or the equivalent of 17,750 head per year. If the demand for range and cull beef is satisfied by on-island production, then 33 percent of big island beef consumption (5,925 head), is range and cull beef. Accordingly, island wide demand for Choice beef is 11,892 head per year. Shipments of cull beef would remain at the present level of 9,375 head. Shipments of feeder cattle, given island demand for Choice beef, would fall to 8,375 head per year (Table 9).

Grain-fed beef production on the big island would rise to 13,068 head per year with 11,892 head being sold on island and 1,176 head being fed on Hawaii and sold on Oahu. Island slaughter would increase to 28,368 head and 20,263 head would be broken after slaughter.

Beef production on Maui is estimated to be 83 percent of island consumption. If the present production of island range and cull beef (2,736 head), meets island needs, then demand for grain-fed beef would be 9,675 head per year. This indicates that all feeder cattle presently originating on Maui (5,500 head), would stay on Maui for feeding, slaughter, processing, and final sale. Furthermore, 2,064 head of range cattle would be fed for Choice beef production. Maui's entire production, 10,200 head, would be slaughtered on-island -- an increase in the number of animals slaughtered of 30 percent. To be consistent with beef that is presently imported, 75 percent of all slaughter is also broken. Shipment of cattle and beef to Oahu would cease.

Beef cattle production of 2,400 head on Molokai exceeds local consumption needs by five percent. If the island were to meet its demands through local cattle supplies, then 2,285 head would be retained on the island. Furthermore if present slaughter of range and cull animals, 400 head, meets island needs then demand for grain-fed beef is approximately 1,885 head per year. This indicates that the 1,700 Molokai cattle presently fed on Oahu would be fed on-island. It is also likely that an additional 185 head which are presently range-fed and shipped to Oahu for slaughter and sale would remain on-island and be grain-fed for local consumption. After island needs are met, the net flow to Oahu would be 115 range and cull cattle. Slaughter on Molokai would increase to 2,285 head and in order to be consistent with present supplies, 1,185 head would have to be broken.

The consumption of beef on Kauai exceeds local supplies by 20 percent. If it is assumed that present production of island range and cull cattle, (1,560 head) meets island needs, then the demand for grain-fed beef would be 3,960 head per year. This is 1,960 head more feeder cattle than are presently available on Kauai and 2,960 more fed cattle than are produced in island feedlots. If it assumed that 1,000 range cattle are instead fed for Choice beef production, Kauai would feed a total of 3,000 head per year. All cattle produced on Kauai are slaughtered on-island and 4,560 head are processed after slaughter. Shipments of cattle to Oahu would cease under these assumptions.

Investment Costs. Big island investment needs total approximately $2.0 million for Scenario 4. This investment is needed to build additional feeding and processing facilities on the big island.

Scenario 4 requires the location of a 5,000 head feedlot on the big island. This lot will feed 12,000 head each year. The remaining 1,068 grain-fed cattle are assumed to be pen-fed on ranches throughout the island. A 5,000 head feedlot will require an investment of $1.5 million dollars which is an average of $292 per head of one time capacity.

The present slaughter facilities on the big island would be capable of handling the increased loads created in Scenario 4. However, existing processing facilities do not have sufficient capacity to meet the demands which would be created by increased grain-fed cattle slaughter and a new plant would be necessary. Investment costs for such a plant would average $24 per head of processed beef. This amounts to an investment of approximately $489,000 at a rate of 20,360 head per annum.

On Maui, the feeding of nearly 7,600 head would require an increase in feedlot capacity of approximately 2,500 head. If the present feeding facilities remain in use, then construction of an additional 1,000 head lot is required. At a rate of 2,400 head per year three lots could accommodate 7,200 head, while the remaining 400 head

TABLE 9.
ESTIMATED FLOWS AND COSTS PER HEAD FOR SCENARIO FOUR, 1983 COSTS.

	HAWAII	MAUI	MOLOKAI	OAHU	KAUAI	STATE
			FLOWS			
Total Slaughter	35500	10300	2400	3200	4600	56000
Total Grain Fed	20200	7564	1885	800	3000	33449
Total Range	15300	2736	515	2400	1560	22511
Island Slaughter	28368	10300	2285	3200	4560	48713
Off-Island Slaughter	7132	0	115	0	40	7287
Island Grain Fed	13068	7564	1885	800	3000	26317
Island Range and Cull	15300	2736	400	2400	1560	22396
Grain Fed						
Feed|Slaughter|Break	11036	6816	1885	800	2500	23037
Feed|Slaughter|Break|Ship	587	0	0	0	0	587
Feed|Slaughter|Ship|Break	589	0	0	0	0	589
Ship|Feed|Slaughter|Break	7132	0	0	0	0	7132
Feed|Slaughter	856	748	0	0	500	2104
Range and Cull						
Range|Slaughter|Break	2900	912	0	2175	780	6767
Range|Slaughter|Break|Ship	5840	0	0	0	0	5840
Range|Slaughter|Ship|Break	0	0	0	0	0	0
Range|Ship|Slaughter|Break	0	0	115	0	0	115
Range|Slaughter	4750	1824	400	225	780	7979
Range|Slaughter|Ship	1810	0	0	0	0	1810
Range|Ship|Slaughter	0	0	0	0	0	0
			PER UNIT COSTS			
Total Slaughter	320.73	397.29	964.00	227.63	469.48	369.28
Total Grain Fed	493.89	501.43	1183.10	518.93	636.73	547.85
Total Range	92.12	109.36	161.54	130.53	259.86	104.59
Grain Fed						
Feed|Slaughter|Break	474.36	510.42	1183.13	518.84	660.89	564.81
Feed|Slaughter|Break|Ship	484.22	519.31	1191.40	518.84	667.67	484.34
Feed|Slaughter|Ship|Break	499.32	492.05	677.26	497.84	587.32	499.32
Ship|Feed|Slaughter|Break	532.72	532.58	532.16	518.84	532.58	532.72
Feed|Slaughter	425.72	419.52	605.85	465.05	515.91	444.68
Range and Cull						
Range|Slaughter|Break	107.39	169.96	739.73	135.57	232.35	139.28
Range|Slaughter|Break|Ship	117.25	178.85	748.00	137.06	240.62	117.25
Range|Slaughter|Ship|Break	132.35	151.59	233.86	140.98	132.35	179.19
Range|Ship|Slaughter|Break	159.44	159.11	158.34	139.64	159.22	158.32
Range|Slaughter	58.10	79.06	162.45	81.78	87.37	71.65
Range|Slaughter|Ship	75.85	95.10	177.37	84.48	102.29	75.85
Range|Ship|Slaughter	105.65	105.32	104.55	85.85	105.43	104.57

could be pen-fed on ranches on the island. The construction of a 1,000 head lot would require an increased investment of $369,000 dollars.

Slaughter facilities on Maui are new and can meet the needs of expanded island marketings. Processing facilities would have to be added to deal with the increased loads of Scenario 4. This would require an additional investment of $450,000 which is an average of $45.01 per head of capacity. Investment requirements for Maui under the assumptions of Scenario 4 would total approximately $819,000.

If Molokai were to service its own needs it must construct a 1,000 head feedlot and new 1,500 head slaughtering and processing facilities. These would cost $369,000, $349,000, and $425,000 respectively, for a total of $1.14 million.

The necessity of expanding feeding on the island of Kauai posed by Scenario 4 would require at least a 1,000 head capacity feedlot. This lot could handle 2,400 head per year. The remaining 1,000 head could either be pen-fed or put on a supplemental range feeding regime which is presently very popular on Kauai. The additional feedlot would require an investment of $369,000. A slaughtering plant has recently been built on Kauai and this plant would be adequate to handle the 4,600 head that would be slaughtered on the island. A processing plant would be needed on the island and this would require an investment of approximately $415,000 or an average investment of $142 per head of capacity. Total investment requirements on Kauai would be $834,000.

Scenario 4 would require a total investment of $4.78 million. Approximately 42 percent of this amount must be invested on the big island and 17, 24, and 17 percent on Maui, Molokai, and Kauai, respectively.

Operating Costs. Feedlot operating costs average $56.69 for the 5,000 head lot on the big island for a total feeding cost of $364.69 per head. Average big island slaughter costs are expected to drop because of increased economies of scale in the operation of existing plants. The estimated decrease in costs is estimated at approximately 10 percent. This results in a reduction in big island slaughter costs to $51.30. The volume of cattle which would require breaking could not be handled by the present plant on the big island and expanded processing facilities would incur operating expenses of $50.55 per head.

Two feedlot operations on Maui presently average $27.90 per head per year in operating costs. A new lot would incur operating costs of $76.02 per head. An average of the three lots operating costs would be $43.94 per head. Slaughter costs on Maui would be expected to fall slightly as economies of scale are realized through increased flows through the plant. Costs for the processing of 10,300 head are estimated at $71.80 per head. Operating costs for new processing facilities handling a volume of nearly 8,000 head per year would be $92.24 per head.

A new feedlot on Molokai would incur operating costs of $90.88 per head on a volume of 1,885 head per year. Slaughter costs for the new plant would be $155.19 per head, while new processing facilities would incur costs of $578.62 per head on a volume of 1,185 head per year.

Feedlot operating costs on Kauai would be $76.02 per head in the new feedlot. The existing slaughter plant would incur operating costs of $80 per head per year. The new processing plant would average $146.28 per head on an annual volume of 3,300 head.

Feedlot costs on Oahu would, under the assumptions of Scenario 4, be $76.93 per head while slaughter costs would increase to $75 per head and processing costs to $55 per head.

Operating Cost Variations. Movements in operating costs are mixed as a result of the assumptions of Scenario 4. Greater island self sufficiency in some cases means increased usage of existing island equipment, while in other cases implies the construction of new facilities which have higher operating costs than the existing plants.

Feeding and slaughter costs drop on the big island. A new 5,000 head feedlot drops operating costs $19.81 from 76.50 to 56.69. Slaughter costs drop 10 percent to $51.30. Processing costs however increase $10.55 (up 26 percent) to $50.55 as a result of new construction.

On Maui, feeding costs increase due to the construction of a new 1,000-head feedlot. Operating costs rise from $27.90 to $43.94, an increase of 57 percent. Slaughter costs on Maui decrease slightly, falling from $73 to $71.80 (2 percent). New processing facilities' construction costs cause breaking and boning costs to increase by 80 percent.

The estimated costs for Molokai reflect the inefficiency of operating small facilities. Slaughter costs rise 10 percent from $140 to $155.19 per head. Processing costs increase from $45 to $578.62 per head -- a cost so high as to eliminate this as a realistic possibility.

Decreases in flows through Oahu operations cause sharp increases in operating costs. Feedlot operating costs increase from $54 to $76.93 per head (42 percent). Slaughter costs rise 29 percent from $57.97 to $75. Processing costs also increase dramatically, moving from $36.05 to $55 per head.

Feeding costs on Kauai fall slightly from $76.50 to $76.02 while slaughter costs fall $20 from $100 to $80 per head. New processing facilities cause breaking or boning costs to increase upward 46 percent from $100 to $146.28 per head.

Marketing Costs. Average marketing costs for cattle slaughtered in the state increase nearly 24 percent, from an estimated $298.49 (under present circumstances) to

$369.28. This is an in total annual marketing costs of $3.95 million. State grain-fed cattle costs increase from $465.59 to $547.85, an increase of 18 percent. Range and cull cattle costs are only slightly affected by the assumptions of Scenario 4 and increase from $102.89 to 104.59 per head.

The smallest increase in average marketing costs is on the big island, from $309.03 to $320.73 per head for an annual slaughter of 35,500 head. This is a rise of $415,000 in island beef marketing costs. Average grain-fed cattle marketing costs increase $23.73 per head from $470.16 to 493.89. Range and cull cattle market expenditures fall for scenario 4 moving from $96.28 to $92.12 per head.

Big island costs for locally processed grain-fed cattle increase $29.04 per head (7 percent). This results from increased volumes of cattle requiring processing and the expenses incurred from the construction of a new plant.

There are no instances in any of the marketing channels for the island of Maui where costs fall as a result of the changes which would take place for scenario 4. Average island marketing costs increase from $283.48 to $397.29 per head (40 percent) and an increase in marketing costs of $1.17 million.

Marketing costs on Molokai are very high. The average marketing costs for Molokai cattle increase from $372.95 to $964.00 (258 percent).

Oahu costs increase as a result of decreased flows through existing facilities. Average marketing costs for the island increase from $187.24 to $218.13 (16 percent per head). Kauai experiences similar increases in average marketing costs. Total marketing costs increase from $289.32 to $469.48 per head. This is an increase of 62 percent or $327,000 per year.

Analysis. The concept of each island producing for its own market does not appear to be a financially feasible alternative. Costs for new machinery and equipment cause operating costs to rise appreciably. In addition, the economies of scale that are achieved in large centralized plants are lost. The combined effect is an increase in total state marketing costs and per unit costs for nearly all the market channel for each island.

SCENARIO FIVE: Kahua Slaughter Facility Closes

Assumptions. The principal assumption of Scenario 1, that the Kahua slaughter and processing plant closes, is maintained and no other changes are postulated to occur in the industry. All cattle which were previously slaughtered by Kahua are slaughtered by Hawaii Meats.

Cattle Flows. The closing of the Kahua plant is not assumed to affect present cattle flows (Table 10). Cattle previously slaughtered at the Kahua plant in Ewa are diverted to Hawaii Meats.

Investment Costs. Increased investments in plant and equipment would be minimal under the assumption of this scenario. Present facilities at Hawaii Meats can handle up to 120 head per day. Flows through the plant are not expected to exceed this level.

Operating Costs. Greater control by the main slaughter plant over the flow of fed cattle from the feedlot allow increased feedlot efficiency. Such efficiency results mainly from the reduced handling of cattle and greater control over slaughter dates. This result in a reduction of the average time on feed from 160 to 155 days, reducing average feeding costs an estimated $12 per head.

Operating Cost Variations. The closing of the Kahua plant and the increased flow of cattle through the main slaughter plant could be expected to reduce slaughter costs from approximately $57.97 to $52 per head. Breaking costs would be expected to drop from $36.05 to $32 per head.

Marketing Costs. Average marketing costs for cattle slaughtered in the state fall from $298.49 to $288.90 per head, a decrease in total marketing costs of $537,000. Grain-fed cattle marketing costs decline nearly 3.5 percent -- from $465.59 to $449.76 and range and cull cattle marketing cost decline approximately 2.2 percent or $15.83 per head. All islands benefit from the centralization of slaughter on Oahu. The extent to which each island benefits is proportional to the flow of cattle from the island to Oahu.

Big island average marketing costs fall $10.79 per head from $309.03 to $298.24. This is a decrease in island marketing costs of $383,000. For grain-fed cattle fed, slaughtered, and broken on Oahu, costs drop from $473.81 to 454.29 per head, a per head decrease of $19.52 and a reduction in marketing costs of $348,000.

The 3,000 Maui feeder cattle shipped to Oahu are marketed for $19.52 per head less under scenario 5 than at present. This is a reduction in marketing costs of $59,000. Molokai feeders shipped to Oahu incur a similar reduction in marketing costs of $19.52 per head and this results in a reduction of island marketing costs of $33,000. Kauai feeders shipped to Oahu show decreased costs of $19,000.

Analysis. The decreases in marketing costs brought about by the increased efficiency of feedlot, slaughter plant, and processing operations combined with the lack of substantial capital investment make this scenario a financially attractive alternative.

SCENARIO SIX: All Cattle are Processed on the Big Island

Assumptions. Scenario 6 is similar to Scenario 2 but assumes that cattle which are presently shipped to Oahu

TABLE 10.
ESTIMATED FLOWS AND COSTS PER HEAD FOR SCENARIO 5, 1983 COSTS.

	HAWAII	MAUI	MOLOKAI	OAHU	KAUAI	STATE
			FLOWS			
Total Slaughter	35500	10300	2400	3200	4600	56000
Total Grain Fed	20200	5500	1700	800	2000	30200
Total Range	15300	4800	700	2400	2600	25800
Island Slaughter	14202	7180	400	3200	3340	28323
Off-Island Slaughter	21298	3120	2000	0	1260	27677
Island Grain Fed	2352	2500	0	800	1000	6652
Island Range and Cull	11850	4680	400	2400	2340	21670
Grain Fed						
Feed|Slaughter|Break	590	751	0	800	500	2641
Feed|Slaughter|Break|Ship	587	252	0	0	0	839
Feed|Slaughter|Ship|Break	589	749	0	0	0	1338
Ship|Feed|Slaughter|Break	17849	3000	1700	0	1000	23549
Feed|Slaughter	586	748	0	0	500	1834
Range and Cull						
Range|Slaughter|Break	1185	912	0	2175	780	5052
Range|Slaughter|Break|Ship	1185	456	0	0	780	2421
Range|Slaughter|Ship|Break	3555	1116	0	0	0	4671
Range|Ship|Slaughter|Break	2588	60	150	0	0	2798
Range|Slaughter	4740	1824	400	225	780	7969
Range|Slaughter|Ship	1185	372	0	0	0	1557
Range|Ship|Slaughter	863	60	150	0	260	1333
			PER UNIT COSTS			
Total Slaughter	298.24	277.34	358.25	176.49	284.74	288.90
Total Grain Fed	452.86	427.05	453.82	440.48	481.22	449.76
Total Range	94.11	105.81	126.15	88.50	133.58	100.61
Grain Fed						
Feed|Slaughter|Break	445.32	401.34	584.32	440.41	530.09	447.38
Feed|Slaughter|Break|Ship	455.18	410.23	592.59	440.41	536.87	441.71
Feed|Slaughter|Ship|Break	459.83	414.21	591.07	448.11	536.80	434.29
Ship|Feed|Slaughter|Break	454.29	454.15	453.73	440.41	454.15	454.23
Feed|Slaughter	406.58	362.68	540.66	407.62	486.39	410.43
Range and Cull						
Range|Slaughter|Break	102.54	118.92	190.92	91.57	151.07	108.27
Range|Slaughter|Break|Ship	112.40	127.81	199.19	93.06	159.34	130.43
Range|Slaughter|Ship|Break	117.05	131.79	197.67	96.98	117.05	120.57
Range|Ship|Slaughter|Break	115.44	115.11	114.34	95.64	115.22	115.37
Range|Slaughter	63.80	80.26	147.26	58.78	107.37	75.88
Range|Slaughter|Ship	81.55	96.30	162.18	61.48	122.29	85.08
Range|Ship|Slaughter	82.65	82.32	81.55	62.85	82.43	82.46

TABLE 11.
ESTIMATED FLOWS AND COSTS PER HEAD FOR SCENARIO SIX - 1983 COSTS.

	HAWAII	MAUI	MOLOKAI	OAHU	KAUAI	STATE
			FLOWS			
Total Slaughter	35500	10300	2400	3200	4600	56000
Total Grain Fed	20200	5500	1700	800	2000	30200
Total Range	15300	4800	700	2400	2600	25800
Island Slaughter	35500	7300	400	2400	3600	49200
Off-Island Slaughter	0	3000	2000	0	1000	6000
Island Grain Fed	20200	2500	0	800	1000	24500
Island Range and Cull	15300	4800	400	2400	2600	25500
Grain Fed						
Feed|Slaughter|Break	590	751	0	0	500	1841
Feed|Slaughter|Break|Ship	19024	252	0	0	0	19276
Feed|Slaughter|Ship|Break	0	749	0	0	0	749
Ship|Feed|Slaughter|Break	0	3000	1700	800	1000	6500
Feed|Slaughter	586	748	0	0	500	1834
Range and Cull						
Range|Slaughter|Break	1185	912	0	2175	780	5052
Range|Slaughter|Break|Ship	7327	456	0	0	780	8563
Range|Slaughter|Ship|Break	0	1176	0	0	0	1176
Range|Ship|Slaughter|Break	0	0	150	0	0	150
Range|Slaughter	4740	1824	400	225	780	7969
Range|Slaughter|Ship	2048	432	0	0	260	2740
Range|Ship|Slaughter	0	0	150	0	0	150
			PER UNIT COST			
Total Slaughter	294.91	289.00	375.75	199.08	291.66	291.55
Total Grain Fed	457.03	447.27	475.71	475.53	491.98	459.11
Total Range	80.87	107.66	132.98	106.93	137.56	95.41
Grain Fed						
Feed|Slaughter|Break	401.12	401.34	584.32	469.79	530.09	436.24
Feed|Slaughter|Break|Ship	461.58	452.23	592.59	469.79	586.87	461.46
Feed|Slaughter|Ship|Break	475.57	462.21	597.07	454.77	592.80	462.22
Ship|Feed|Slaughter|Break	483.67	475.71	475.71	475.53	475.71	475.68
Feed|Slaughter	365.72	362.68	540.66	431.00	486.39	397.38
Range and Cull						
Range|Slaughter|Break	89.48	118.92	190.92	110.57	151.07	113.38
Range|Slaughter|Break|Ship	99.34	127.81	199.19	112.06	159.34	106.32
Range|Slaughter|Ship|Break	113.33	137.79	203.67	115.98	11.33	137.78
Range|Ship|Slaughter|Break	134.44	134.11	133.34	114.64	134.22	133.32
Range|Slaughter	54.08	80.26	147.26	71.78	107.37	70.46
Range|Slaughter|Ship	71.83	96.30	162.18	74.48	122.29	80.48
Range|Ship|Slaughter	95.65	95.32	94.55	75.85	95.43	94.55

increase. Slaughter costs increase $11.23 per head, from $48.95 to $60.18, up 23 percent. The decreased flow of cattle causes processing costs to increase from $41.29 to $50.55 per head (32 percent).

The net result of shipping 40 percent of the feeders overseas is a 7 percent increase in average feeder cattle marketing costs ($32.50 per head). This amounts to an increase of $485,000 in marketing costs for the 14,930 fed cattle remaining in the state.

3. Shipment of sixty percent of the feeders currently fed on Oahu overseas.

Sixty percent of the Oahu bound feeder cattle, 14,609 head, if shipped to the mainland, would reduce feedlot usage by 60 percent. This would cause feedlot operating costs to increase from $45.36 to $76.14, a rise of $30.78 per head or a 68 percent cost increase. Slaughter costs would increase $17.46 to $66.41 per head. This is a 36 percent increase in average slaughter cost. Processing costs would increase from $41.29 to 57.49 (39 percent per head).

A sixty percent outshipment of feeders amounts to an 11 percent increase in marketing costs for remaining feeder cattle. Total marketing costs per head increase to $522.21, up $49.85. The cost of processing 16,268 head increases by $509,000.

Analysis. Whatever the benefits of sending feeder cattle to the mainland the short run cost to the industry created by severe declines in plant capacity utilization is a factor which must receive attention. Sending even 20 percent of the Oahu bound feeders to the mainland can increase costs to the remaining cattle by more than $250,000. If mainland shipments were to compensate for this cost increase they would have to return a net increase of $55 per head.

Since mainland cattle shipments are not likely to occur on a regular basis it would seem that increased shipments can only cause dramatic shifts in the average costs of feeding, slaughter and processing the cattle remaining in the State.

APPENDIX A
CATTLE AND BEEF TRANSPORT COSTS

Land Cartage

In estimating land cartage costs for the movement of live cattle and processed beef it was assumed that there is a significant distance between marketing units, that is, between the ranch, feedlot, slaughter plant, and retailer. This requires the rental of a semi-tractor and trailer or van for a period of three hours, which is sufficient time to load, transport, and unload either cattle or processed beef. Semi-tractor rental rates were obtained from the Western Motor Tariff Bureau Inc. rate schedules; and a ten percent surcharge was added to account for trailer rental.

Land cartage of live cattle can take place at a number of points in the marketing process. Feeder cattle are generally hauled to the wharf for interisland barging and subsequently to the feedlot from the wharf. In some cases feeder cattle are hauled directly to neighbor island feedlots. Fed cattle are hauled from the feedlot to the slaughterhouse. Range animals may be moved to the wharf for interisland shipment and then to the slaughterhouse from the wharf, or directly to an on-island slaughter house.

The trailer used for movement of live cattle shipments was assumed to be forty-feet by eight-feet by twelve-feet in size, with a capacity of 60 feeders or 34 range or fed cattle. Feeder cattle were estimated to have an average weight of 600 pounds and range and fed animals an average weight of 1,100 pounds.

Processed beef is shipped as either carcasses or boxed beef. Both forms are generally moved on pallets. Vans with dimensions of twenty-feet by eight-feet by eight-feet are generally used and have a capacity of 16 loaded pallets. Boxed beef capacity is approximately 30,000 pounds while carcass beef capacity is estimated at 25,000 pounds, or 85 percent of boxed capacity.

As shown in Table A-1, range-fed cattle is the most expensive form to transport. Costs vary from $3.96 per head on Hawaii to $4.40 on Kauai, and average $4.20 over the five islands.

Carcass beef is the second most expensive form to transport. Costs range from $2.84 per head on Hawaii to $2.97 per head on Maui, Molokai, and Kauai. Feeder cattle cartage costs average $2.44 per head, with a range from $2.28 per head on Hawaii to $2.52 per head on Maui, Molokai, and Kauai.

The least expensive form of cartage is boxed beef which averages $1.60 per head over all islands. Per head costs range from $1.50 on Oahu to $1.67 on Kauai.

All transport costs reveal the same cost hierarchy. Range-fed beef is the most expensive form to transport. It is followed, in decreasing cost of transport, by carcass beef, feeder cattle, and boxed beef. The costs outlined here are only shipment costs and do not take into account possible shrinkage costs, or, in the case of live cattle, death loss allowances or interisland shipment recovery costs.

Interisland Barge Costs

Interisland movements of live and processed beef are assumed to take place in the same trailers and vans used in calculating of land cartage costs. Estimated interisland charges include barge freight, trailer rental, wharfage, insurance, and sales tax. All shipments are assumed to be to the port of Honolulu, which is the primary destination for interisland movements of live and processed beef.

Interisland barging of range and cull cattle have average costs of $19.22 per head, while movements of feeders cost an average $11.21 per head. Carcass beef

TABLE A-1.
ESTIMATED LAND CARTAGE COSTS PER HEAD FOR LIVE AND PROCESSED BEEF, 1983.

Island	Feeder Cost per Head	Range|Fed Cost per Head	Carcass Cost per Head	Boxed Beef Cost per Head
Hawaii	2.28	3.96	2.84	1.58
Maui	2.52	4.29	2.97	1.63
Molokai	2.52	4.29	2.97	1.63
Oahu	2.34	4.07	2.71	1.50
Kauai	2.52	4.40	2.97	1.67
Average	2.44	4.20	2.89	1.60

TABLE A-2.
INTERISLAND BARGING COSTS FOR LIVE AND PROCESSED BEEF, 1983.

ISLAND	Feeder Cost per Head	Range|Fed Cost per Head	Carcass Cost per Head	Boxed Beef Cost per Head
Hawaii	11.58	19.91	15.05	8.36
Maui	11.22	19.25	13.33	7.39
Molokai	10.80	18.48	12.21	6.78
Kauai	11.22	19.25	12.21	6.78
Average	11.21	19.22	13.20	7.33

TABLE A-3.
ESTIMATED PER HEAD COSTS FOR INTERISLAND SHIPMENTS
OF LIVE CATTLE AND PROCESSED BEEF, 1983.

ISLAND	Feeder Cost per Head	Range|Fed Cost per Head	Carcass Cost per Head	Boxed Beef Cost per Head
Hawaii	16.20	27.94	20.59	11.44
Maui	16.08	27.61	19.01	10.52
Molokai	15.66	26.84	17.89	9.90
Oahu	2.34	4.07	2.71	1.50
Kauai	16.08	27.72	17.89	9.94
Average	16.01	27.53	18.84	10.45

shipments average $13.20 on a per head equivalent basis while boxed beef shipment costs average $7.33 per head equivalent (see Table A-2).

Interisland Shipment Costs

Interisland movements of cattle and beef require cartage at both the point of origin and the destination in addition to interisland barging. The costs of these movements on a per head basis are illustrated in Table A-3.

Interisland movement of range beef is not always from ranch to slaughterhouse. Cattle may be sent to the feedlots for brief periods to wait integration into the slaughterhouse schedule. Whenever this occurs, the average cost for movement of range beef will be slightly higher than stated in Table A-3.

APPENDIX B
ESTIMATION OF FEEDLOT ESTABLISHMENT AND OPERATING COSTS

Present Situation

The maximum carrying capacity of feedlots in the state of Hawaii was estimated at 20,000 head per day in March of 1983. The main feedlot on Oahu accounted for 15,000 head, or 80 percent of the total. Feeding operations on Maui accounted for an additional 2,500 head while facilities on the big island carry approximately 2,000 head. Small pen feeding operations throughout the state contribute an additional 500 head per day capacity. These estimates include only facilities which are currently in operation at the time and do not make provision for cattle on supplementary feeding programs.

The main feedlot is presently averaging a 160 day feeding cycle corresponding to a turnover rate of approximately 2.3 times per year. Given an estimated efficient capacity of 15,000 head, a total yearly flow of 34,500 head could be maintained. In 1981, however, flows through the Oahu lot were estimated at approximately 23,600 head, or 68 percent of capacity. Feedlot management cites a number of factors for this low utilization rate. Seasonality of shipments from ranches is perhaps the most important cause. A second factor is the shipment of odd-lot consignments which must often be kept in pens of significantly greater capacity. A third factor is the shipment by ranchers of unsorted cattle. These shipments have a tendency to finish off at varying rates, decreasing feedlot utilization as the pens are continually topped off.

Mainland feeding cycles usually run from 130 to 150 days; the majority having a feedlot turnover averaging close to 2.4 per year. The difference between the mainland and Oahu lot cycles is largely the result of the recovery period required on interisland shipment of cattle. The difficult voyage causes a 10-15 percent shrink and generally stresses the cattle sufficiently to put them off feed. Recovery may take 15 to 30 days.

Neighbor island feedlots are, for the most part, operations with capacities less than 1,000 head. This is in part due to EPA pollution controls on lots in excess of 1,000 head. Though supplementary feeding may occur in conjunction with the operation of a small lot, allowing fed-beef inventories to exceed 1,000 head, interviews with feedlot operators indicate that the potential costs of adhering to the EPA regulations is a constraint limiting feedlot expansion.

Interviews with neighbor island feedlot operators revealed that their feedlots are averaging a much shorter feeding period, managing to cycle cattle in 120 to 140 days. This is a turnover rate of 2.8 times per year. Neighbor island feedlots are generally servicing a market requiring Good-Yield grade 2 cattle , which require shorter periods of time on feed than regimes designed to produce some Choice grade animals. Also, feeding times are shorter because no recovery period for interisland shipping is required.

There were approximately 5,350 cattle fed on neighbor islands during 1981. This is 107 percent of the estimated one-time capacity in 1983 and reflects the closing, or limitation of operations, on neighbor islands, particularly on the big island. Big island feedlot operators cited high cartage costs and the lack of suitable roughage as the main reasons for declines in operating capacity.

Alternative Feeding Systems

Several alternative feeding and slaughtering systems are analyzed in this study. An underlying assumption for all alternatives is that if new feeding and slaughtering facilities are built in the state , they will be located closer to the source of cattle supplies. This assumption parallels the trend observed on the mainland over the past two decades. Consequently, in deciding on alternative sites and utilization levels of feedlots and slaughter plants, a major consideration was to choose sizes and utilization levels consistent with cattle numbers on Hawaii and Maui.

Alternative sizes and utilization levels for feeding systems were: (1) one-time feedlot capacities of 1,000, 5,000, and 10,000 head per year; and (2) utilization levels of 75 and 100 percent assuming an inventory turnover rate of 2.4. The 1,000 head lot represents the largest lot possible without being subject to EPA regulations and it is likely to be typical of lots constructed to feed cattle produced by a single ranch or by a small group of ranchers on a single island. The 5,000 head lot represents a commercial feedlot feeding cattle from a number of ranches on one or more islands. This size lot might operate in competition with one or more other large lots on other islands. The 10,000 head lot is likely as large as would be economically feasible given the current and projected supply of feeder cattle in

the state. Even if larger lots were deemed necessary, costs per head would likely be comparable. Most economies of size in ownership and operating costs are realized in lots of 10,000 head. Beyond that point, most economies result from more efficient procurement of feeder cattle and feed and from more effective cattle marketing (Meisner and Rhodes).

A turnover rate of 2.4 times per year is assumed for three reasons. First, since some of the alternatives considered call for feedlots located on neighbor islands, it is likely that the majority of cattle will not require interisland shipment recovery periods. Second, it is assumed that cattle from feedlots considered in this study are primarily destined for the Honolulu Choice beef market and require full feeding. Third, the present practice of consignment feeding tends to reduce utilization because of inefficiencies in pen stocking rates.

All feedlots considered were unpaved, dirt lots with 300 to 325 sq. ft. of pen space per head of one time capacity. Other common construction characteristics included concrete fencing with metal pipe posts inserted in concrete and on-site feed processing and water systems. Primary sources for supporting information included USDA cost of production surveys (USDA 1978,1982; Gee, Vanarsdal and Gustafson; Vanarsdal and Nelson), current USDA cattle feeding cost estimates (USDA 1983), other research publications (Williams and Farrie, Meisner and Rhodes) and Midwest Service Plain publications dealing with construction of feedlot and waste facilities (Cooperative Extension Service 1975, 1976), and interviews with Hawaii feedlot operators. The costs represent what might be expected, on average, from a variety of feedlots of the general types and sizes analyzed.

The feedlot sizes and utilization levels analyzed are shown in Table B-1. Costs were estimated for 75 percent and 100 percent utilization levels for each of three lot sizes: one thousand head, five thousand head, and ten thousand head. Cost estimates for different utilization levels reflect economies in the use of variable inputs such as labor, equipment usage, etc., as well as the spreading of fixed costs such as management and ownership over more animals.

A complement of machinery was compiled which included machinery utilized in feedlots of all three sizes. This complement was constructed from sources mentioned previously. In general, the larger lots utilize more specialized equipment for cattle feeding, manure handling, etc., than do the smaller lots. The 1,000 head lot is assumed to be operated in conjunction with other farming and ranching operations which share use of equipment such as tractors, cars, and pickups. The largest lot is assumed to share a semi-truck with some other business operation such as a slaughter plant. In some cases, equipment requirements were rounded to an even number of units while source budgets had shown fractional units. An attempt was made in constructing the budgets to reflect costs of establishing lots "from scratch" with new equipment. Thus partial units were avoided, to the extent deemed practical.

Pen costs were aggregated for each size feedlot. Pen costs include the costs of constructing pens, gates, feed bunkers, concrete aprons, water pipes, troughs, float valves, etc. Pollution control systems were included for all but the one thousand head lot. Pollution control costs represent a composite estimate of a wide range of systems. Different topography, soil type, and run-off regulations dictate different systems. However, costs are consistent with costs of systems recently constructed in the central plains, adjusted for Hawaii conditions.

Feedlot facilities include such costs as office buildings or space, water pumps and storage tanks, frontage roads, shops and or garages, etc. needed to support the feedlot operation. These costs may vary widely from one feedlot to another, but costs presented are considered representative of facilities built in recent years. Feed processing systems include feed mills, mixing facilities, short-term storage

TABLE B-1.
SIZES AND UTILIZATION LEVELS OF FEEDLOTS.

One Time Capacities	Cattle Fed Per Year[1] 75 Percent	100 Percent
1,000	1,800	2,400
5,000	9,000	12,000
10,000	18,000	24,000

[1]assumes lots turn cattle an average of 2.4 times per year.

facilities, feed processing buildings, and all equipment associated with feed preparation. Feed processing costs can vary widely with different processing methods. Some turn-key "cadillac" feed processing systems can cost more than $100 per head of capacity even for large commercial lots. Costs were based on the more typical systems.

Cattle handling facilities include squeeze chutes, permanent loading chutes, cattle scales, working alleys, hospital pens, etc. Land preparation costs were based on recent costs of similar types of preparations in other sectors of Hawaii agriculture. These costs include mounding, constructing alleys, and all other dirt work associated with feedlot construction. They do not include road surfacing or frontage roads.

In general, pen construction costs are proportional to capacity after passing the three-to five-thousand head capacity levels. Higher costs for smaller lots are associated with higher materials costs and contracting costs for smaller jobs. Pollution control costs tend to be high one-time investments that increase less than proportionally to capacity. Facilities have a high minimum level which increases costs for small lots. But facilities tend to increase in proportion to capacity in larger lots with increased need for office space, larger water systems, etc. Cattle handling facilities have a relatively high minimum investment but increase significantly less than feed lot capacity for larger lots. Land preparation costs are basically proportional to capacity. Land space requirements increase proportionally for pen space but less proportionally in terms of space for other facilities.

Feedlot investment costs were derived from investment requirements for each lot size (Table B-2). Investment costs were summarized for tractors, trucks, other machinery, pens, buildings and other equipment, and land investment. Machinery investment totaled nearly $89,000 or $89 per head for the one thousand head lot. Machinery costs dropped to $74 per head or just under $372,000 for the five thousand head lot. Lower per head costs are due to the use of more efficient, specialized equipment for feed and manure handling. Further economies in machinery investment of the same basic nature are shown between the five thousand and ten thousand head capacity lots. Machinery costs drop from $74 per head to just under $68 per head which is roughly half as much as the reduction between the one and five thousand head lots.

Even greater economies of scale were calculated for pens and other equipment. Initial investment costs per head for pens and equipment dropped from about $234 per head for 1,000 head lots to $174 per head for the five thousand head feedlot. This assumes straight line depreciation with zero salvage value. Interest costs for machinery and equipment were estimated using current interest rates and estimated investment costs. For simplicity, it was assumed that the average investment over the life of an item of machinery or equipment would be equal to one-half of the initial investment. This assumes straight line depreciation with a zero salvage value. The interest rate on machinery was assumed to be 14 percent while a rate of 10 percent was used for pens and equipment. This probably overestimates interest costs for machinery slightly but is a reasonable approximation.

Interest costs on land were calculated on the full purchase price. Land, unlike machinery and equipment, does not necessarily depreciate over time. The appropriate interest rate for land is its expected rate of return in its next best use. But, lacking such information for land in general, the long term interest rate on full land value is a reasonable approximation. General overhead costs are estimated for the thousand head lot only. General overhead represents costs of an overall farming or ranching operation that must be allocated among a number of enterprises to cover the full cost of operation and includes such items as charges for office space, telephone use, office equipment, record-keeping, etc., that support all enterprises on the ranch. The

TABLE B-2.
INVESTMENT SUMMARY - 1983 COST ESTIMATES

	ONE TIME CAPACITIES		
	1000 HD	5000 HD	10000 HD
Tractors, Trucks and Machinery	88,793	371,867	683,636
Pens, Buildings and Equipment	233,562	869,808	1,465,152
Land Investment	46,875	218,750	418,750
Total Investment	369,230	1,460,425	2,567,538
Investment Per Hd. Capacity	369	292	257

TABLE B-3
PER HEAD NON-FEED OPERATING COSTS FOR ALTERNATIVE FEEDLOTS, HAWAII, 1983.

One Time Lot Capacity	1000	1000	5000	5000	10000	10000
Annual Utilization Head per Year	1800	2400	9000	12000	18000	24000
Ownership Costs	26.02	19.51	18.46	13.85	16.27	12.20
Variable Costs	64.88	56.51	49.05	42.84	39.03	33.16
Total Costs	90.89	76.02	67.51	56.69	55.30	45.36

two larger enterprises are assumed to be independent, full time operations with all costs included in individual budgets. General overhead costs for the small feedlot were estimated from USDA cost-of-production surveys.

Investment Costs

Table B-3 shows ownership costs per head of capacity, by category, for all feedlot sizes and utilization levels. In total, ownership costs range from 26.02 per head for the thousand head lot at 75 percent utilization to $12.20 for the ten thousand head lot at 100 percent utilization. The per head cost savings are 25 percent between 75 percent and full utilization levels for each lot, by definition of ownership costs. However, full utilization of the thousand head lot brings ownership costs per head down to just over one dollar higher than 75 percent utilization of the five thousand head lot, while full utilization of the five thousand head lot drops per head costs below those of the ten thousand head lot at full utilization. These figures highlight the importance of high utilization levels in controlling production costs.

Economies of size with respect to feedlot ownership costs are not a dominant factor in total costs of cattle feeding. The differences of $8 to $10 per head between larger and smaller lots at different utilization levels are equivalent to less than one dollar per hundred-weight of cattle sold. Differences in feedlot costs related to feed efficiency, rates of gain, death loss, feed costs, etc., often vary by more than these differences among pens of similar cattle fed during any given year.

Variable Costs

Non-feed variable costs were calculated for all size and utilization combinations. All costs are shown on a per head basis. Some costs were derived from total cost figures and others were estimated directly on a per head basis from USDA cost of production surveys and budget estimates. All base calculations were made for 75 percent utilization levels which is typical of average utilization rates in cost-of-production surveys. All costs were adjusted for conditions in Hawaii after consulting with feedlot operators.

Non-feed costs of ownership and operation estimates represent objective estimates of economies of scale and utilization for cattle operations of the sizes relevant for the Hawaii beef industry. Other cost differences among feedlots are more likely to be related to characteristics unique to particular operations rather than those inherent in size and utilization.

Variable costs, by definition, are affected by the level of output or utilization of fixed facilities. Thus, total variable cost for any given feedlot budget item will be different for different levels of utilization. Costs may vary in proportion to utilization levels. Most variable costs, however, increase no more than proportionally to output as output moves towards full capacity. Economies of capacity utilization are determined by the extent to which overall variable costs increase proportionally less than output as utilization approaches designed capacity.

Labor costs would be expected to increase significantly as feed lots move from 75 percent to full capacity utilization. However, the increases will be less than proportional to the increase in output. Machinery and equipment crews will perform many of the same activities regardless of whether all pens are full or some are only partly full or empty. But, more cattle will require more time to feed and will leave more manure to be hauled and will require more handling. Labor costs were assumed to increase by 10 percent for all lot sizes as utilization levels were increased by 33 percent from 75 percent to full capacity.

Total management costs were held constant at both 75 percent and full capacity utilization. While higher utilization levels may require more management time, managers are generally expected to adjust to varying work loads without adjustments in compensation. Accounting, consulting and legal fees are not expected to significantly vary

with changing levels of utilization. Accounting procedures would likely be the same but there would be more ledger entries or more customer accounts to handle. Consulting fees likely would be very similar with possibly a few more problems at higher utilization levels. Legal services are mostly routine and thus are affected very little by the number of cattle on feed. All three services were increased by only 2 percent for full utilization compared with 75 percent capacity.

The remaining variable items are closely related to the numbers of cattle fed. Veterinary expenses, trucking, utility costs, and the cost of operating and repairing machinery and equipment were increased by 25 percent for full capacity utilization compared with the lower use level. Miscellaneous expenses were assumed to be the same at both levels.

The reductions in average variable costs resulting from full capacity utilization are shown in Table B-3. Total variable costs per head are reduced from $64.88 to $56.51 for the thousand head lot, a 13 percent cost reduction. Gains are similar for the five thousand head lot, which shows a reduction from $49.05 to $42.84 per head, a 13 percent reduction. The ten thousand head lot shows greater gains and costs drop from $39.05 to $33.16 a head, a 15 percent reduction. Greater economies of utilization for the larger lot results from spreading service costs such as management, accounting, legal fees, etc. over a greater number of cattle. Economies of utilization in any given feedlot will depend on management practices, labor contracts, types of facilities, etc. Thus, economies achieved by one lot may be quite different from another of a similar type and size. The estimates shown in Table B-3 are, however, reasonable estimates of the economies that are achievable in most feedlots currently in operation in Hawaii.

Economies of Size in Utilization in Cattle Feeding

Economies of size include cost reductions attributable to more efficient utilization of both fixed and variable factors of production. All costs, including ownership costs and variable costs, totaled $90.89 per head for the one thousand head feedlot at 75 percent capacity. The five thousand head lot showed total non-feed costs at only $67.51 for the same utilization level, a reduction of over 26 percent. The percentage reduction was greater between the five thousand head lot and the ten thousand head lot. The per head cost of $45.36 for the ten thousand head at 75 percent capacity is 33 percent less than similar costs for the five thousand head lot. The ten thousand head lot has an estimated cost per head that is 39 percent less than costs for the thousand head lot.

However, non-feed costs must be put into perspective with total cost of gain in cattle feeding. For example, recent total costs of gain in feedlots have run from $700 to $750 per head in Hawaiian feedlots, Thus non-feed costs have amounted to only five-to ten-percent of total costs of cattle feeding. Thus a 40 percent lower non-feed cost may amount to a two-to four-percent cost advantage. A $30 to $36 per head savings in non-feed costs for the ten thousand head lot is a significant advantage for the larger lot. But, it is not an advantage so large as to prevent competition from smaller, highly efficient cattle feeding operations.

Gains from high levels of utilization can offset most of the economies of size achieved from larger lot size. A one thousand head lot at full capacity shows a per head cost of $76.02, only $8.51 higher than the five thousand head lot at 75 percent capacity. And the five thousand head lot at full capacity has a cost of $56.69, just over one dollar more per head costs than in the ten thousand head lot at 75 percent capacity. At the extremes, per head costs in the ten thousand head lot at full capacity are less than half the non-feed costs of the one thousand head lot at 75 percent capacity.

In summary, there are significant economies of size in cattle feeding. Most of those economies are achieved by feedlots in the ten thousand head capacity range. Non-feed costs decline more over the range from one thousand head capacity to five thousand head capacity than from five thousand to ten thousand head. Overall cost savings related to feedlot size amount to about 40 percent of non-feed costs between the one thousand head and ten thousand head lot sizes. But this amounts to only two- to four-percent of total costs of cattle feeding. Thus, it is possible to offset economies of size by more efficient feedlot gains or better overall management. But the $30 to $36 non-feed costs savings for the larger lot are none the less significant.

Economies of size can be largely offset or greatly magnified by feedlot capacity utilization. Full feedlot utilization reduced estimated per head costs by 13-to 15-percent in comparison with 75 percent capacity utilization. These gains were sufficient to offset most economies of size, particularly between the five thousand and ten thousand head lot sizes. Thus efficient utilization of feedlot capacities may be nearly as important as lot size for size and utilization levels analyzed in this study.

There are cost advantages inherent in larger cattle feeding operations. And, there are cost advantages inherent in utilization of feedlots at their full designed capacities. But there are cost differences that are unique to individual feedlots and feedlot managers. A well managed feedlot is more likely to operate at near full capacity with minimum feed costs of gain. Such feedlots will show maximum economies of size for larger lot sizes. However, economies of size will not be sufficient to offset poor management, high feed costs and low utilization levels. Management is a key factor in cattle feeding. But good management can only realize its full potential in an efficiently sized feedlot.

APPENDIX C
ALTERNATIVE SLAUGHTERING SYSTEMS

Given the existing distribution of cattle among islands and the current packing industry structure in Hawaii, alternative slaughter processing systems were considered with varying levels of plant utilization. The plant sizes considered in this study were:

1) .75 head per hour =6 head per day = 1,500 head per year;

2) 5 head per hour = 40 head per day = 10 thousand head per year;

3) 10 head per hour = 80 head per day = 20 thousand head per year;

4) 15 head per hour = 120 head per day = 30 thousand head per year.

All plants were budgeted at 100 percent of one-shift capacity utilization and plants (2) and (3) were also budgeted at 200 percent of one-shift capacity. Thus, six size and utilization combinations were considered.

All plants were assumed to handle cattle only. All were assumed to slaughter cattle and perform limited processing and boning, but were not budgeted for boxed beef processing. These costs were considered separately and are discussed in a separate section. All have hide storage space and facilities for edible rendering. The two smaller plants use a bed or cradle system while the two larger plants use a rail system.

Estimating Procedures and Assumptions

A major builder and equipment supplier for slaughter and processing plants, Koch Supplies Inc., provided typical plans and quotations for three slaughter-processing plants. All were based on January 1983 prices. Koch's estimates were a primary source for many capital investment estimates, such as equipment and supplies, refrigeration systems, building, and site work. The estimates were supplemented with information from other studies in North Dakota (Steroba, Bedker, and Dunn), West Virginia (Durst and Kachn), and California (Cothern, Peard, and Weeks), work by the U.S. Department of Agriculture (Hammons and Smalley), and published data by the American Meat Institute (Kropf and Breidenstein; Wilson and Knutson). These costs were then adjusted to reflect either delivery to Hawaii or, in the case of buildings, estimated local construction costs.

Published data were relied on for technical coefficients such as land required, utility requirements, and labor and management needs. Published data in most cases were converted to a cost per head basis and estimates for the different plant sizes were obtained by interpolation. Coefficients from previous studies, when used, were adjusted upwards at an average annual inflation rate of 10 percent. Utility, insurance and tax rates, land values, and labor rates, were adjusted to reflect the Hawaiian situation.

A myriad of building and equipment combinations exist for slaughtering and processing firms. Budget estimates presented here are intended for planning purposes only. No individual budget for a given size and utilization level is intended to accurately represent any such plant of that size and use. However, budget comparisons should provide a means of putting the cost estimates of various plant sizes and utilization levels in their proper perspectives. Any omitted capital and operating costs items or over/under estimates are believed to affect the level rather than general shape of the cost functions presented here.

In estimating operating costs for each slaughter plant, interest on equipment and refrigeration systems was calculated on the basis of a 14 percent interest rate on one-half of the investment, assuming a zero salvage value. A similar procedure, using a 10 percent interest rate, was used in calculating interest on buildings, site work, and rendering facilities. Land and sewer system interest costs were calculated using a 10 percent rate on the full cost of investment.

The estimated life of equipment and refrigeration was 10 years for a single shift operation and five years for a double shift. A straight line depreciation rate was assumed with no salvage value.

The estimated life of buildings, site work , and rendering facilities was 25 years for a single shift operation and 12.5 years for a double shift. Again, straight line depreciation with no salvage value was assumed.

Property taxes were based on 26 percent of assessed value of total capital assets. The tax rate was 0.04 per $1,000 assumed valuation, which is the current rate in Honolulu for real property.

Fire, liability, and related property insurance was based on the rate charged a major meat packer in Honolulu, $0.185 per $100 of replacement costs. Coverage was assumed for all capital investments except site work, land, and sewage systems.

Estimates of the amount of wage labor were based on studies in West Virginia (Durst and Kachn), by the USDA (Hammons and Smalley), and the American Meat Institute (Kropf and Breidenstein). Double shift plants were assumed to employ just under twice the labor force of single shift plants. The wage rate used was $8.50 per hour plus 25 percent for fringe benefits. Number of slaughter days was assumed to be 250 or 2,000 slaughter hours per year.

Management requirements were derived in a manner similar to that for labor requirements. The average salary was assumed to be $30,000 per year plus 25 percent for fringe benefits.

The West Virginia study (Durst and Kachn) was used primarily to estimate utility requirements on a per head basis. Electricity rates were those charged a major meat packer in Honolulu ($0.196/kwh). Fuel oil requirements were estimated on a per-head per-year basis also. Rates were retail fuel oil prices in Honolulu, $1.05 per gallon.

Water requirements were based on a formula developed by Logan and King: Y=0.362X; where Y = annual water consumption (100 cubic feet) and X = annual slaughter capacity. Water and sewage rates were those charged in Honolulu.

Previous studies provided a basis for estimating other expenses as a group. Other expenses include such items as repair and maintenance, laundry, containers, advertising, accounting and legal fees, and office supplies. Other expenses varied widely between studies, typically ranging around 15 percent of operating expenses. Other expenses were estimated as 15 percent of the sum of previous operating expenses.

Economies of Size and Utilization

Capital investment and operating cost estimates are summarized in Table C-1. There are significant economies of size for larger plant sizes. Per head investment costs decline from nearly $233 per head for the 1,500 head per year to $152 per head for the 30,000 head per year plant. Even greater economies are obtained by operating a given plant at 200 percent of its one-shift capacity. Investment costs per head for the 10,000 head plant operating two shifts are just 57 percent of the cost for the same plant operating a single shift. Per head costs decline from $185 per head to $106 per head, respectively. Similarly, per head investment requirements for the 20,000 head plant operating two shifts are 57 percent of the costs for the same plant operating one shift. Per head investment declines from $162 per head to $93 per head, respectively.

Based on the capital investment estimates, it is more economical to invest in a smaller plant and operate at a 200 percent capacity than to build a larger plant. For example, per head investment costs for a 40 head per day plant operating two shifts are $106 per head, while investment costs for an eighty head per day plant operating one shift are $162 per head. Similarly, per head investment costs are lower for an 80 head per day plant with an annual slaughter of 40,000 head than for a 120 head per day plant with a 30,000 head annual slaughter, i.e., $93 per head verses $153 per head.

Estimated annual operating costs per head for single-shift plants show similar economies of size as do investment cost estimates (see Table C-1). Per head costs decline sharply between the 6 and 40 head per day plants and then decline moderately between the 40, 80, and 120 head per day plants. Per head operating costs for single shift plants range from $141 per head for the 1,500 head plant to $46 per head for the 30,000 head plant.

Operating cost economies are less between double and single shift plants than those for were capital costs. Operating costs per head for the 40 head per day plant at 200 percent utilization are 86 percent of the same plant operating a single shift. Per head costs are estimated to be $72 per head for a single shift and $62 per head for the two shifts. Similarly, per head operating costs for the 80 head per day plant operating two shifts are 80 percent of the

TABLE C-1.
ESTIMATED CAPITAL INVESTMENT AND OPERATING COSTS FOR SLAUGHTERING PLANTS: BY SIZE AND UTILIZATION, OAHU, 1983

Plant Size (hd|day)	6	40	40	80	80	120
Utilization (percent)	100	100	200	100	200	100
Annual Capacity (head per year)	1500	10000	20000	20000	40000	30000
Total Capital Investment	349290	1854800	2127160	3244120	3701920	4574880
Investment per Unit An. Capacity	232.86	185.48	106.36	162.21	92.55	152.50
Total Operating Expenses	211382	718017	1243155	1107891	1758211	1278461
Operating Expenses per Unit Annual Capacity	140.92	71.80	62.16	55.39	43.96	45.95

costs for the same plant operating just one shift. Per head costs decline from $55 per head to $44 per head when going from one to two shifts.

The comparison between building a smaller plant and operating it at a higher utilization rate verses a larger plant at a lower utilization rate differs for operating costs relative to investment costs. Based on per head operating cost estimates, an 80 head per day plant can be operated with a single shift for less than a 40 head per day plant with two shifts. Per head operating costs are $55 and $62 respectively. The per head operating costs are very close between operating an 80 head per day plant with two shifts and operating a 120 head per day plant with one shift. Operating costs are $55 and $62 per head respectively.

Fixed costs (interest, depreciation, taxes, and insurance) are all proportional to capital investment costs. Thus, fixed costs comprise a larger share of total operating cost for larger plants than smaller plants, and for single shift plants than double shift plants. Economies of size are less evident in variable costs than in fixed costs. The primary source of economies of size are in labor and management and other expenses. These items together account for a large percentage of all operating costs for the 6 head per day plant and a smaller but still substantial portion of the operating costs for a 120 head per day plant. Thus fixed costs become a bigger burden for larger plants and there are fewer areas in which to reduce variable operating costs.

APPENDIX D
ALTERNATIVE PROCESSING SYSTEMS

In the last few years processing of beef beyond the carcass stage has become an increasingly important aspect of beef marketing in Hawaii. The availability of mainland subprimal and portion cut beef has put substantial pressure on local slaughterhouses to fabricate beef prior to sale to retailers. Processing of beef beyond the quarter carcass stage requires a fairly specific set of equipment. Full use of this machinery does not appear to occur until capacities approach 50 head per hour. Below this level some savings do seem possible in conveyors, rail systems, and work areas; however, the basic machinery requirements are unchanging at sizes below fifty head per hour. This puts possible processing facilities in Hawaii at a distinct disadvantage in comparison to larger mainland operations.

Information on the costs and equipment requirements for portion control processing is limited and estimates provided here are drawn primarily from Cothern, Peard and Weeks. Estimates of investment and operating costs for Hawaiian operations were interpolated from this report and adjusted to reflect higher construction costs, freight, and inflation. This report dealt with operations ranging in size from 30 to 300 head per hour. Costs for Hawaii were derived from the figures for the 30 head per hour operation and adjusted to reflect the lower operating and investment costs of smaller operations.

In estimating the decline in operating costs for smaller operations it was assumed that 30 percent of labor cost was "fixed", that is unchangeable, because it involved specific aspects of the processing operation required at any given capacity. The additional 70 percent of labor was assumed to vary directly in proportion to operating capacity. Meat cutters, for example, are assumed to be able to handle a range of tasks making their services variable with output.

Investment in plant and equipment is essentially fixed. The items listed for a 30 head per hour operation are in terms of single units – one band saw, one grinder, one chipper, one boxer, etc., and it is assumed that no smaller unit is available. Some investment costs, however, are variable. These include the amount of table work space required and the extent of the conveyor or rail systems. A review of the costs presented in Cothern, et. al, indicated that approximately 30 percent of total investment cost was of a variable nature while 70 percent of investment was fixed in the sense that a smaller scale or size does not appear practical.

Given the limited nature of the information available and the further restriction created by the assumptions necessary to interpolate the data, it is difficult to draw many conclusions from the estimated investment and operating costs for the different plant sizes under consideration, particularly since these figures were the result of specific assumptions concerning economies in investment and operation. The cost estimates do, however, provide some idea of the necessary capital expenditures and operating costs for these different plant sizes; and, in conjunction with the slaughterhouse estimates, they allow some insights into the feasibility of these operations.

The processing of beef can be divided into a number of sub-operations. These include breaking the carcass into primal cuts, subprimal fabrication, hamburger production, and portion cuts fabrication. In addition, at each stage of the operation it is possible to box part or all of the output.

Carcasses are quartered prior to beginning the breaking operation. They then pass along a rail or conveyor to the breaking tables. Here the quarters are trimmed, boned, cut, and sawed into primals. Primal cuts may be further processed, through additional trimming, boning, and cutting, into sub-primals or they may be sealed and boxed for sale. Sub-primals may be sealed and boxed or sent along the line for fabrication into portion cuts. Portion cuts are usually wrapped, weighted, and sealed prior to boxing. The hamburger operation utilizes the cuttings from the other processes. It is assumed that the final product is either tubed or made into patties.

In developing cost estimates for various stages of beef processing, it was assumed that all carcasses are broken

into primal cuts and the cuttings and scraps used in hamburger production. It is then assumed that half of the primal cuts are boxed for sale while the remaining half is sent on for breaking into sub-primals. Again it is assumed that half of the sub-primals are boxed and half are processed into portion cuts. If an operation processes only to the primal stage it is unlikely that costs will be changed by any radical amount as there is only an added cost for boxing the additional half of the primal cuts. Operations which process to the sub-primal phase will incur slightly higher costs than those shown in Table D-1 because of increased packing and boxing costs.

The slaughtering facilities under consideration, 0.75, 5, 10, and 15 head per hour plants, do not appear to provide enough capacity to make the processing of beef economical when compared with mainland operations. The smaller plants, the 0.75 and five head per hour plants, exhibit very high operating and investment costs per head. The 0.75 head per hour plant requires an investment of $450 per head -- based on a yearly capacity of 1,500 head -- while operating costs are estimated at $716 per head. The five head per hour plant, 10,000 head per year, has estimated investment costs for full stage processing of $71.61 per head of annual capacity. Operating costs are estimated at $133.36 per head. If the five head per hour plant is run on a double shift, investment costs per head are reduced by 50 percent. Operating costs, however, drop only slightly to $119.70. Neither of these plants appears to be even marginally economical in terms of processing beef.

Investment and operating costs for the 10 and 15 head per hour processing facilities do not compare favorably with the 30 head per hour plant. The economies of size present in the processing technology are significant even at this level of production. Full stage processing for a 10 head per hour plant operating on a double shift entails investment costs of $19.10 per head of annual capacity and operating costs average $75 per head. Investment costs for a 30 head per hour plant are just under $16 per head and operating costs are 47.67 per head of annual capacity. Investment costs drop by $3 per head and operating costs by over 52 dollars per head. Investment costs for a 15 head per hour plant run on a double shift are $13.53 per head of of annual production, while operating costs average $60.12 per head of annual production. By running a 15 head per hour plant on a two shift per day schedule investment costs can be brought two dollars below the 30 head per hour plant. However, operating costs continue to be significantly higher and are over $12 per head greater than the 30 head per hour plant.

It is important to note that a 30 head per hour plant is considered a small and marginally efficient operation in terms of mainland standards. Those plants possible in Hawaii are much less efficient than the 30 head plant and these differences would increase dramatically in comparison to the processing facilities of firms supplying mainland beef to Hawaii. These differences are so great that the barrier created by transportation costs to Hawaii becomes insignificant.

The move toward increased processing of beef in Hawaii appears to be the result of a need to provide retailers with a form of beef which they demand. Apparently, the alternative of selling unbroken beef or even primal cut beef is even less attractive than the establishment of expensive processing facilities.

APPENDIX E
PRESENT FLOWS AND COSTS BY ISLAND

Island of Hawaii

Beef consumption on Hawaii was estimated at 9.2 million pounds (Table 1). Total cattle production in 1981 was 35,500 head or 202 percent of consumption. However, only an estimated 40 percent of island consumption was Hawaii beef. Total marketing costs for Hawaii production were estimated at 10.9 million dollars or an average cost of $308 per head (Table E-1). Forty percent of Hawaii slaughter, or 14,200 head, were killed on-island, while 60 percent, 21,300 head, were sent off-island prior to slaughter. All but a small percentage of shipments were to Oahu. Feedlots on the Big Island are not extensive and accounted for only 12 percent of that island's grain-fed beef production. Island-fed beef accounted for 17 percent of the island slaughter with range and cull cattle making up 83 percent of the island kill.

Total grain-fed production for Big Island beef was 20,200 head in 1981. This represents 57 percent of Hawaii slaughter. Marketing costs for big island grain-fed beef were approximately $9.5 million, or approximately $468 dollars per head of grain-fed slaughter.

The main channel for marketing Hawaii grain-fed beef was the shipment of feeders to Oahu for finishing and processing. This continues to be the case in 1983, though a small but increasing number of cattle are being shipped to Maui feedlots for finishing. Feeder cattle shipments from the island of Hawaii totaled 17,847 head in 1981 -- which was 88 percent of island grain-fed slaughter. Total marketing costs were estimated to be $8.46-million or an average cost of $474 per head. A major portion of the cattle moving through this channel were from ranches with financial interests in Oahu processing facilities. Range and cull cattle slaughter was 15,300 head, or 43 percent of 1981 island slaughter. Marketing costs were $1.47 million or an average of $96 per head.

Sixty-one percent of the Hawaii range and cull cattle were marketed on Oahu. As can be seen from the last section of Table E-1, the major streams for this flow were three and four. An estimated 3,555 head moved through channel three accounting for 23 percent of Big Island range and cull slaughter, incurring an average per head

TABLE D-1.
SUMMARY OF PER-HEAD INVESTMENT AND OPERATING COSTS
FOR BREAKING AND PORTION CONTROL OPERATIONS HAWAII, 1983

	Plant Size								
Hd|hr.	.75	5	5	10	10	15	15	20	30
Hd|yr.	1500	10000	20000	20000	40000	30000	60000	40000	60000
Percent Util. of Capacity	100	100	200	100	200	100	200	100	100
Breaking									
Invest.	200.07	31.81	15.91	16.97	8.48	12.02	6.01	9.54	7.07
Oper.	311.35	62.62	61.30	40.67	39.97	33.35	32.86	29.70	26.04
Grinding									
Invest.	82.96	13.19	6.60	7.04	3.52	4.98	2.49	3.96	2.93
Oper.	81.97	15.72	15.16	9.88	9.58	7.93	7.72	6.96	5.98
Fabricating Primals									
Invest.	113.48	18.05	9.02	9.62	4.81	6.82	3.41	5.41	4.01
Oper.	271.22	45.57	34.12	25.66	19.91	19.03	15.81	15.17	12.39
Boxing									
Invest.	53.84	8.56	4.28	4.57	3.23	3.23	1.62	2.57	1.90
Oper.	51.55	9.45	9.12	5.74	5.56	4.50	4.37	3.88	3.26
Breaking and Grinding									
Invest.	283.04	45.01	22.50	24.00	12.00	17.00	8.50	13.50	10.00
Oper.	393.32	78.34	76.46	50.55	49.54	41.28	40.57	36.65	32.02
Breaking, Grinding, and Fabricating Primals									
Invest.	396.52	63.05	31.53	33.63	16.81	23.82	11.91	18.92	14.01
Oper.	664.54	123.91	110.58	76.21	69.46	60.31	55.75	52.36	44.41
Breaking, Grinding, Fabricating Primals and Portions									
Invest.	450.36	71.61	35.81	38.19	19.10	27.05	13.53	21.48	15.91
Oper.	716.09	133.36	119.70	81.95	75.01	64.81	60.12	56.24	47.67

TABLE E-1.
ESTIMATED CATTLE MARKETING COSTS:
THE ISLAND OF HAWAII, 1981 FLOWS, 1983 COSTS.

	HEAD	PERCENT	COST	COST|HEAD
Total Slaughter	35500	100	10970455	309.03
Island Slaughter	14200	40		
Off-Island Slaughter	21300	60		
Total Grain Fed	20200	57	9497331	470.16
Total Range	15301	43	1473123	96.28
Grain Fed				
1. Feed|Slaughter|Break|Sell	590	2	262741	445.32
2. Feed|Slaughter|Break|Ship|Sell	587	2	267190	455.18
3. Feed|Slaughter|Ship|Break|Sell	589	2	272046	461.88
4. Ship|Feed|Slaughter|Break|Sell	17849	50	8457052	473.81
5. Feed|Slaughter|Sell	586	2	238254	406.58
6. Feed|Ship|Slaughter|Break|Sell	0	0	0	466.24
Range and Cull				
1. Slaughter|Break|Sell	1185	3	121514	102.54
2. Slaughter|Break|Ship|Sell	1185	3	133194	112.40
3. Slaughter|Ship|Break|Sell	3555	10	423393	119.10
4. Ship|Slaughter|Break|Sell	2588	7	319504	123.46
5. Slaughter|Sell	4740	13	302402	63.80
6. Slaughter|Ship|Sell	1185	3	96639	81.55
7. Ship|Slaughter|Sell	863	2	76475	88.62

cost of $119. An additional 2,588 head, or 17 percent of the range and cull slaughter, flowed along path four with an average cost of $123 per head.

Hawaii range and cull cattle marketings utilize the least cost streams to a much greater degree than fed-beef marketings. Range and cull animals offer ranchers more alternatives in both local and Oahu markets. From interviews with ranchers, it appears that some ranchers with affiliations with Oahu slaughterhouses feel no obligation to send their cattle to Oahu and will seek out the most profitable channel. Finally, the many small town stores on Hawaii provide a market for quarter carcass beef.

Island of Maui

Beef consumption on Maui was estimated at 7 million pounds in 1981. Production during this same period was estimated at 5.7 million pounds or 84 percent of local consumption. Island slaughter, derived from Hawaii Agricultural Reporting service reports, was estimated at 58 percent of consumption and the contribution of island raised beef to Maui consumption was slightly less than 40 percent.

Maui accounted for 18 percent of 1981 statewide slaughter. Marketing costs for the 10,300 head kill are estimated at 2.9 million corresponding to an average of $283 per head (Table E-2). On-Island slaughter was 7,060 or 69 percent of total Maui slaughter. An estimated 31 percent of Maui cattle (3,240 head), were slaughtered on Oahu. Maui feedlots accounted for 45 percent of the grain-fed beef attributed to Maui, with the remainder being fed on Oahu.

Total grain-fed cattle production on Maui was 5,500 head which is 53 percent of total slaughter. Marketing costs for grain-fed production were estimated at $2.41 million -- an average cost of $438 per head.

The marketing of Maui fed-beef resembles that on the island of Hawaii. However, a smaller percentage of fed-beef moves through the traditional marketing channels. This is, in part, due to the greater feeding activity taking place on-island and partly because Maui ranches are not as closely allied with the large ranches controlling the traditional stream.

Range and cull cattle slaughter comprised 47 percent of island slaughter (4,800 head). Marketing costs were

TABLE E-2.
ESTIMATED CATTLE MARKETING COSTS:
ISLAND OF MAUI, 1981 FLOWS, 1983 COSTS.

	HEAD	PERCENT	COST	COST|HEAD
Total Slaughter	10300	100	2919855	283.48
Island Slaughter	7060	69		
Off-Island Slaughter	3240	31		
Total Grain Fed	5500	53	2408850	437.97
Total Range	4800	47	511004	106.46
Grain Fed				
1. Feed|Slaughter|Break|Sell	751	14	301405	401.34
2. Feed|Slaughter|Break|Ship|Sell	252	5	103377	410.23
3. Feed|Slaughter|Ship|Break|Sell	749	14	311782	416.26
4. Ship|Feed|Slaughter|Break|Sell	3000	55	1420998	473.67
5. Feed|Slaughter|Sell	748	14	271285	362.68
Range and Cull				
1. Slaughter|Break|Sell	912	19	108453	118.92
2. Slaughter|Break|Ship|Sell	456	10	58280	127.81
3. Slaughter|Ship|Break|Sell	1116	23	149370	133.84
4. Ship|Slaughter|Break|Sell	60	1	7388	123.13
5. Slaughter|Sell	1824	38	146394	80.26
6. Slaughter|Ship|Sell	372	8	35823	96.30
7. Ship|Slaughter|Sell	60	1	5297	88.29

estimated to be $511,000, or approximately $106 dollars per head. Almost 98 percent of range and cull cattle were killed on-island, and 57 percent of the slaughter was consumed on-island.

Feeding and processing activities on Maui appear to be undergoing some major changes. Feedlots reported increased utilization and greater percentages of Choice beef production. The local slaughter plants, though primarily custom operations, have been breaking a greater percentage of carcasses for Maui consumption. Interviews with ranchers and feedlot operators indicate greater efforts on the part of Maui ranchers and feeders to satisfy island demand for beef. It is likely that future shipments of Maui feeder cattle to Oahu (as a percentage of total production) will decline as will the shipment of carcass and boxed beef.

Island of Molokai

Estimated beef consumption on the island of Molokai was 587,000 pounds while production was 617,000 pounds (Table 1). Island slaughter supplied an estimated 330,000 pounds for local consumption. The remaining 275,000 pounds, 44 percent of consumption, was supplied by off-island sources.

The island of Molokai produced was 2,400 head in 1981 which corresponded to four percent of State slaughter. Total marketing costs were in excess of $895,000 which is an average cost of $373 per head (Table E-3). On-island slaughter was estimated at 400 head, or 17 percent of total production. Off-island slaughter was 2,000 head or 83 percent of island slaughter.

All grain-fed cattle from Molokai are fed and processed on Oahu. The 1,700 head were marketed at a cost of $804,000, an average per head cost of $473. Almost all Molokai grain-fed cattle came from the largest ranch on the island. This ranch has long standing ties with the feedlot and slaughterhouse on Oahu.

Fifty-seven percent, or 400 head, of the 700 range-cull cattle slaughter were killed on-island at a cost of $147 per head. This slaughter went directly toward meeting local demand and no carcass or boxed beef was shipped. About 300 range and cull animals were shipped to Oahu for

TABLE E-3.
ESTIMATED CATTLE MARKETING COSTS:
ISLAND OF MOLOKAI, 1981 FLOWS, 1983 COSTS.

	HEAD	PERCENT	COST	COST|HEAD
Total Slaughter	2400	100	895092	372.95
Island Slaughter	400	20		
Off-Island Slaughter	2000	80		
Total Grain Fed	1700		804687	473.35
Total Range	700		90405	129.15
Grain Fed				
1. Feed|Slaughter|Break|Sell	0	0	0	584.32
2. Feed|Slaughter|Break|Ship|Sell	0	0	0	592.59
3. Feed|Slaughter|Ship|Break|Sell	0	0	0	593.12
4. Ship|Feed|Slaughter|Break|Sell	1700	71	804518	473.25
5. Feed|Slaughter|Sell	0	0	0	540.66
6. Feed|Ship|Slaughter|Break|Sell	0	0	0	497.28
Range and Cull				
1. Slaughter|Break|Sell	0	0	0	190.92
2. Slaughter|Break|Ship|Sell	0	0	0	199.19
3. Slaughter|Ship|Break|Sell	0	0	20	199.72
4. Ship|Slaughter|Break|Sell	150	6	18353	122.36
5. Slaughter|Sell	400	17	58904	147.26
6. Slaughter|Ship|Sell	0	0	0	162.18
7. Ship|Slaughter|Sell	150	6	13127	87.52

slaughter. Half of these were broken or boned before sale at a cost of $122 per head, and half were sold as quartered carcass at a cost to $88 per head.

Quarantine and animal health problems on Molokai have reduced production and limited shipment of beef off-island. Until this problem is solved island production is not likely to increase.

Island of Oahu

Consumption on Oahu in 1981 was estimated at 74.6 million pounds. Island production was 1.6 million pounds, about two percent of consumption. Oahu produced six percent of the State's 1981 slaughter. The highly urban nature of Oahu has greatly reduced its beef cattle production potential. Only a few ranches continue to raise cattle and Oahu slaughter results primarily from dairy cow culls. In 1981, only 800 fed-cattle were killed. These were marketed at a cost of $368,000 or an average of $460 per head (Table E-4).

Over 90 percent (or 2,175 head) of Oahu cull cattle were processed after slaughter. Total marketing costs were $217,000 or $100 per head. The remaining cull animals, 225 head, were sold in carcass form at a cost of $15,000 or $65 per head.

Oahu production of both fed-beef and range-cull cattle can be expected to continue to decline as urban land pressure increases. It is likely that slaughter will fall or at best remain constant in the future.

Island of Kauai

Estimated 1981 beef consumption on Kauai was 3.8 million pounds. Production was approximately 3.2 million

TABLE E-4.
ESTIMATED CATTLE MARKETING COSTS:
ISLAND OF OAHU, 1981 FLOWS, 1983 COSTS.

	HEAD	PERCENT	COST	COST|HEAD
Total Slaughter	3200	100	599183	187.24
Total Grain Fed	800	25	368005	460.01
Total Range	2400	75	231178	96.32
Grain Fed				
1. Feed|Slaughter|Break|Sell	800	100	367941	459.93
2. Feed|Slaughter|Break|Ship|Sell	0	0	0	459.93
3. Feed|Slaughter|Ship|Break|Sell	0	0	0	461.66
4. Ship|Feed|Slaughter|Break|Sell	0	0	0	459.93
5. Feed|Slaughter|Sell	0	0	0	425.09
Range and Cull				
1. Slaughter|Break|Sell	2175	91	216600	99.59
2. Slaughter|Break|Ship|Sell	0	0	0	101.08
3. Slaughter|Ship|Break|Sell	0	0	0	105.00
4. Ship|Slaughter|Break|Sell	0	0	0	103.66
5. Slaughter|Sell	225	9	14568	64.75
6. Slaughter|Ship|Sell	0	0	0	67.45
7. Ship|Slaughter|Sell	0	0	0	68.82

pounds (Table 1), or 4,600 head. This was is about eight percent of the estimated State slaughter. Marketing costs for this production were estimated at $1.3 million, corresponding to an average of $289 per head (Table E-5).

About 56 percent of island production, a estimated 2,570 head, were killed on-island while 44 percent, or 2,030 head, were shipped to Oahu prior to slaughter. Kauai produced cattle accounted for only 1.76 million pounds, which is 46 percent of island consumption.

Grain-fed cattle comprised 43 percent of island slaughter, or about 2,000 head. These were marketed at a cost of $982,000, or approximately $491 per head. Half of the grain-fed slaughter were cattle sent to Oahu for feeding and processing. The majority of fed cattle, as is the case on other islands, move through the oldest traditional marketing channel, stream four. A great percentage of feeders shipped from Kauai are from a few large ranches with long standing ties to Oahu slaughterhouses.

Total Range and Cull cattle marketing costs were $348,000, which is an average of $134 per head. Slaughter on Kauai accounted for 60 percent of total Kauai range and cull kill while the remaining slaughter was the result of shipments of feeders and culls to Oahu.

The island of Kauai has been undergoing some dramatic changes in recent years. The island is looking inward to find a demand for its beef. In recent years ranchers have been using supplementary feeding to improve carcass quality and increase island slaughter to supply island markets. With the exception of a few large ranches with interests in Oahu facilities, it appears that island production will be used increasingly to meet Kauai's consumption needs.

TABLE E-5.
ESTIMATED CATTLE MARKETING COSTS:
THE ISLAND OF KAUAI, 1981 FLOWS, 1983 COSTS.

	HEAD	PERCENT	COST	COST|HEAD
Total Slaughter	4600	100	1330556	289.32
Island Slaughter	2570	56		
Off-Island Slaughter	2030	44		
Total Grain Fed	2000	43	981964	490.98
Total Range	2600	57	348893	134.17
Grain Fed				
1. Feed|Slaughter|Break|Sell	500	25	265046	530.09
2. Feed|Slaughter|Break|Ship|Sell	0	0	0	536.87
3. Feed|Slaughter|Ship|Break|Sell	0	0	0	538.85
4. Ship|Feed|Slaughter|Break|Sell	1000	50	473618	473.67
5. Feed|Slaughter|Sell	500	25	2431995	486.39
Range and Cull				
1. Slaughter|Break|Sell	780	30	117836	151.07
2. Slaughter|Break|Ship|Sell	780	0	124288	159.39
3. Slaughter|Ship|Break|Sell	0	0	0	119.10
4. Ship|Slaughter|Break|Sell	0	30	0	123.24
5. Slaughter|Sell	780	30	83749	107.37
6. Slaughter|Ship|Sell	0	0	0	122.29
7. Ship|Slaughter|Sell	260	10	22983	88.40

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Note: As part of a structural reorganization, the Hawaii Agricultural Experiment Station and the Hawaii Cooperative Extension Service have been merged administratively under the name HAWAII INSTITUTE OF TROPICAL AGRICULTURE AND HUMAN RESOURCES, College of Tropical Agriculture and Human Resources, University of Hawaii.

Hawaii Institute of Tropical Agriculture and Human Resources
College of Tropical Agriculture and Human Resources
Noel P. Kefford, Director of the Institute and Dean of the College

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